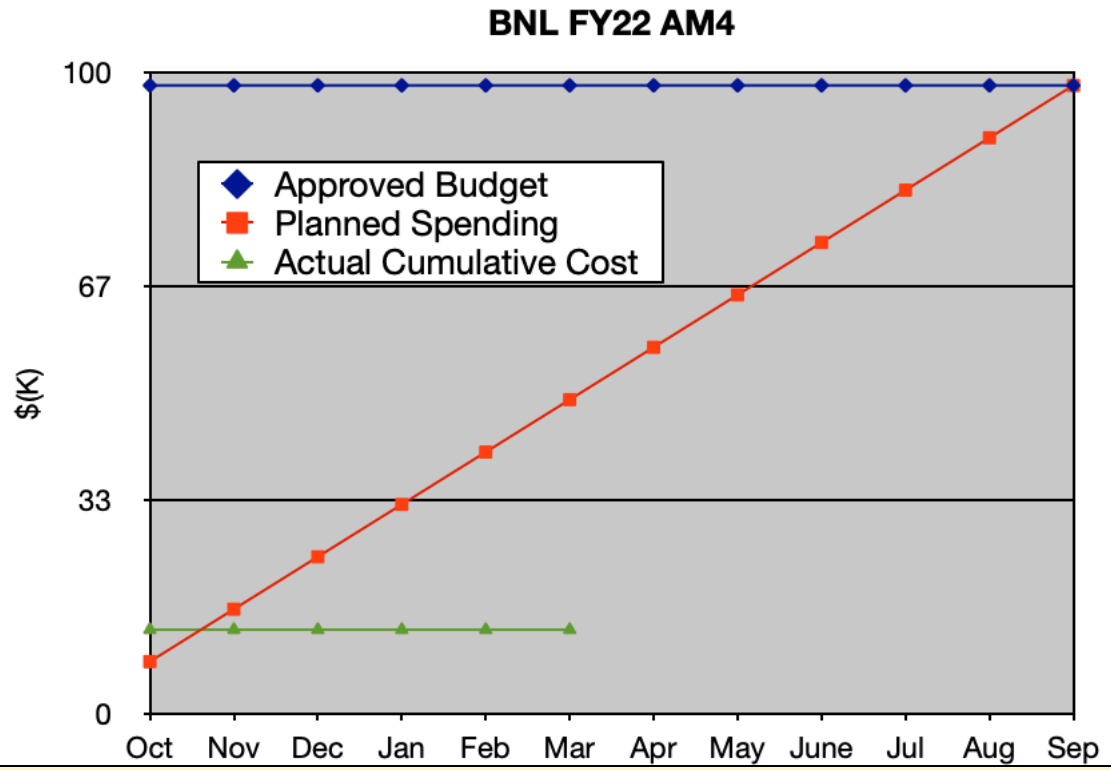
NUCLEAR CRITICALITY SAFETY PROGRAM (NCSP)

FY2022 2nd QUARTER REPORTS

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: AM4 **M&O Contractor Name**: BNL **Point of Contact Name:** David Brown **Point of Contact Phone:** 631-344-2814	**Reference:** DP0909010 **Date of Report:** 7 April, 2022

BUDGET



1. Carryover into FY 2022 = $ 3,298
2. Approved FY 2022 Budget = $ 48,000
3. Total FY 2022 Budget w/Carryover: $51,298
4. Actual spending for 1st Quarter FY 2022 = $13,144
5. Actual spending for 2nd Quarter FY 2022 = $0
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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 generating a draft document defining the TNSL code or software interface in NCSP Quarterly Progress Report. (AM4)		In Q2, BNL will focus on finalizing the GNDS-2.0 specifications document for submission to WPEC in May 2022.

			At the CSEWG annual meeting during Nuclear Data Week, it was noted that the legacy ENDF/B format ran out of MAT numbers for TSL evaluations. CSEWG has adopted a format rule change as a work-around but BNL still needs to reassign numbers to support the large number of new TSL materials developed by the NCSP. This issue does NOT affect the new GNDS-2.0 format.
Q2	Provide a status report on generating a draft document defining the TNSL code or software interface in NCSP Quarterly Progress Report. (AM4)		Work at BNL paused until students rejoin the NNDC during the summer
Q3	Provide a status report on generating a draft document defining the TNSL code or software interface in NCSP Quarterly Progress Report. (AM4)		
Q4	Provide a status report on generating a draft document defining the TNSL code or software interface in NCSP Quarterly Progress Report. (AM4)		

ACCOMPLISHMENTS

PUBLICATIONS

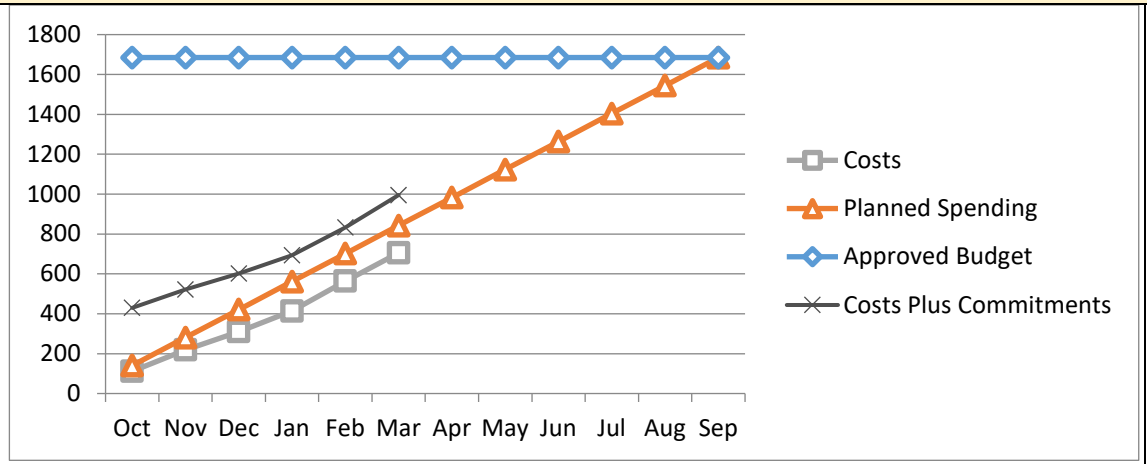
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

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-2022 Q2)

NCSP Element and Subtask: AM1, 2, 3, 5, 7 **M&O Contractor Name**: LANL **Point of Contact Name:** Joetta Goda/Bob Little/Jen Alwin **Point of Contact Phone:** 505-667-2812/505-665-3487/505-667-7252	**Reference:** DP0909010 **Date of Report:** April 15, 2022

BUDGET



1. Carryover into FY 2022 = $50,000
2. Approved FY 2022 Budget = $ 1,635,000
3. Total FY 2022 Budget w/Carryover = $1,685,000
4. Actual spending for 1st Quarter FY 2022 = $310,627 (plus end of Q1 commitments of $291,167 for a total of $601,794)
5. Actual spending for 2nd Quarter FY 2022 = $394,636 for a total of $705,263 (plus end of Q2 commitments of $290,293 for a total of $995,556)
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $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 a status report on MCNP6 user support (AM1)		
Q1	Provide status reports on LANL participation in US and International analytical methods collaborations (AM1)		
Q1	Provide reports on summer intern work accomplished (AM1)		
Q1	Issue an MCNP V&V report, including MCNP6 automated acceleration and convergence (AM1)		

Q1	Provide a status report on NJOY maintenance and user support (AM2)		
Q1	Provide status reports on LANL participation in US and International analytical methods collaborations (AM2)		
Q1	Provide status on Adaptive-in-temperature Method for fast on-the-fly Sampling of Thermal Neutron Scattering Data in MCNP6 (AM3)		
Q1	Provide status reports on LANL participation in US and International analytical methods collaborations (AM5)		
Q1	Provide status on incorporation of benchmark Experiment Correlations into the Whisper NCS software (AM7)		
Q2	Provide a status report on MCNP6 user support (AM1)		
Q2	Provide status reports on LANL participation in US and International analytical methods collaborations (AM1)		
Q2	Provide status of all MCNP6 and Whisper progress at the NCSP Technical Program Review (AM1)		
Q2	Provide a status report on NJOY maintenance and user support (AM2)		
Q2	Provide status reports on LANL participation in US and International analytical methods collaborations (AM2)		
Q2	Update NJOY2016 to process new ENDF/B formats for mixed coherent/incoherent elastic thermal scattering and to properly handle recent IAEA photo-nuclear libraries that specify anisotropic angular distributions (AM2)		Completed early in Q1
Q2	Provide status on Adaptive-in-temperature Method for fast on-the-fly Sampling of Thermal Neutron Scattering Data in MCNP6 (AM3)		
Q2	Provide status reports on LANL participation in US and International analytical methods collaborations (AM5)		

Q2	Provide status on incorporation of benchmark Experiment Correlations into the Whisper NCS software (AM7)		
Q3	Provide a status report on MCNP6 user support (AM1)		
Q3	Provide status reports on LANL participation in US and International analytical methods collaborations (AM1)		
Q3	Provide MCNP6 Criticality training course (AM1)		
Q3	Provide a status report on NJOY maintenance and user support (AM2)		
Q3	Provide status reports on LANL participation in US and International analytical methods collaborations (AM2)		
Q3	Provide status on Adaptive-in-temperature Method for fast on-the-fly Sampling of Thermal Neutron Scattering Data in MCNP6 (AM3)		
Q3	Provide status reports on LANL participation in US and International analytical methods collaborations (AM5)		
Q3	Provide status on incorporation of benchmark Experiment Correlations into the Whisper NCS software (AM7)		
Q4	Provide a status report on MCNP6 user support (AM1)		
Q4	Provide status reports on LANL participation in US and International analytical methods collaborations (AM1)		
Q4	Issue an expanded MCNP V&V report, specifically targeting additional unstructured mesh models of criticality benchmarks (AM1)		
Q4	Create ENDF/B-VIII.0-based covariance data library for MCNP/Whisper (AM1)		
Q4	Obtain approval to open-source the Whisper code and release it on GitHub (AM1)		
Q4	Provide a status report on NJOY maintenance and user support (AM2)		
Q4	Provide status reports on LANL participation in US and International analytical methods collaborations (AM2)		
Q4	Complete the GNDStk component of NJOY21 that will provide an interface (C++ and python) for GNDS 2.0 standard compliant files. (AM2)		

Q4	Provide status on Adaptive-in-temperature Method for fast on-the-fly Sampling of Thermal Neutron Scattering Data in MCNP6 (AM3)		
Q4	Provide data files and report for h-h2o and graphite on-the-fly S(alpha,beta) temperature effects. (AM3)		
Q4	Provide status reports 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)		
Q4	Provide status on incorporation of benchmark Experiment Correlations into the Whisper NCS software (AM7)		
Q4	Deliver final modified version of Whisper to LANL with an ANS conference paper to disseminate the work (AM7)		

ACCOMPLISHMENTS

- AM1 - MCNP® Maintenance and Support, Uncertainty Analysis Development, and Modernization
  - Education
    - Four online MCNP6 classes with 63 students: See separate summary of MCNP classes.
    - Thesis committee member for UNM graduate student working in area of criticality calculations.
    - 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
    - Region-dependent sensitivity-uncertainty data for NCS validation. A journal article submission is in progress (UNM).
    - Subcritical multiplication methods draft paper is complete and is being submitted to the Nuclear Science and Engineering journal (UNM).
    - Study on the impact of correlated fission multiplicity models in criticality calculations is near completion. A journal article submission is in progress (UNM).
    - Continued studying improved subcritical multiplication calculation efficiency through fission-matrix-based importance sampling in preparation for upcoming NCSD topical meeting (UNM).
    - Further investigation of nuclear data adjustment augmented by machine learning using Whisper benchmarks, sensitivities and covariance data. A journal article has been submitted to Annals of Nuclear Energy (OSU).
    - The MCNP6.3 code is frozen and has been made available to internal LANL users for testing. Currently, we are finalizing documentation, V&V, installation tools and more related to the RSICC release. We are also seeking approval from LANL's Feynman

Center for Innovation and the Office of General Council to approve this release with respect to licensing, copyright statements, and any intellectual property disclosures required.

- Virtually attended OECD/NEA mini-WPNCS meetings:
  - On 1/25/22, attended the 1st meeting of the WPNCS Subgroup 9: Transport in random geometries as an observer. Various presentations by the participants took place, including discussions from the subgroup organizer, A. Zoia, helping to describe the subgroup work to be done. Not much had been done by most of the participants to date, but the specifications of the benchmark and the scope of the work was further clarified, including a presentation on previously investigated methods used to model random geometries by the CEA.
  - On 1/26/22, attended the 1st meeting of the WPNCS Subgroup 11: Bias and correlated data, comparison of methods as a participant. The subgroup organizer, A. Hoefer, discussed the benchmark specifications and answered any lingering questions of the participants. Following this, several participants, including those from France, Sweden, Switzerland, and Germany, shared some of their preliminary results. The methods used included generalized linear-least squares, Bayesian Monte Carlo, and trending analysis. We, the LANL participants, are actively working on these benchmarks and will supply our results using both generalized linear-least squares and Bayesian Monte Carlo methods for comparison with the other participant results in the subgroup.

- MCNP Support and Maintenance
  - Support MCNP6 users. MCNP Forum, website, email, direct interactions, etc.
    - Continued modernizing MCNP public website.
  - Continue to modernize MCNP coding, utilities, and update the release notes and code manual documentation.
  - 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 for release with MCNP6.3.
    - Started running and comparing V&V tests with and without MCNP6.3 features (Doppler Broadening Rejection Correction, Automated Acceleration and Convergence Testing).
    - Started running V&V tests with JEFF3.3 data
  - Completed 10 critical benchmarks using Unstructured Mesh to be added to Los Alamos Benchmark Suite (LABS)
- MCNP Data – ENDF/B-VIII.0 Covariance Library
  - Work has progressed on the development of a processed covariance library. Investigations into NJOY behavior for processing MF35 (covariances of energy spectra) has led to an identified workflow for this data.
  - All ENDF/B-VIII.0 MF35 data was processed and provided to the EUCLID LDRD-DR project for initial testing and use and is being adapted for the general-purpose library. The library will use a format based on NDI3 (which is based loosely on GNDS), and tools are being developed to manipulate data in this format.
  - Two covariance testing tools have been prototyped independently and they are being combined into a single production tool. We are still on track for a delivered library this FY.

- AM2 - NJOY Development and Maintenance, Uncertainty Analysis Development, and Modernization
  - User Support

- Various questions on the GitHub issues trackers
- Support on ACE formats for photonuclear and CPT files
- Support on how to use ENDFtk and ACEtk at LANL

- NJOY2016 (completed early in Q1)
  - One update to NJOY2016 (NJY2016.66) was released. Q1 report contains detailed information on the content of this update (in short: support for mixed mode elastic thermal scattering and photonuclear data processing). For more information: https://github.com/njoy/NJOY2016/blob/develop/README.md
  - We are currently working on the future NJOY2016.67. This update resolves a number of issues encountered when processing the newly released JENDL5 nuclear data library - we anticipate that evaluations from this library will make it into ENDF/B-VIII.1.
  - The following minor changes and fixes are included in this version:
    - several corrections to the ERRORR source code to remove compiler warning messages (these were made while looking into issue #211 for gcc-11 compilation)
    - increased the nxcmax array size parameter in ACER to resolve issue #228
    - increased the nthr array size parameter in PURR to resolve an issue in JENDL5 Mn55 (issue #233)
    - corrected ACER following issue #188. Evaluations using LAW=7 in MF6 data that are added to the DLWH block are impacted by this change (i.e., for secondary particle types that are not the incident particle type). For ENDF/B-VIII.0, only the secondary alphas from MT16 in Be9 is impacted by the change.
  - A large number of compiler warnings have now been resolved (unused variables, large static arrays converted into allocatable arrays, etc.). There are still a lot of warnings, but their number is heavily reduced. For source files that were corrected in this way, the remaining warnings relate to equality comparisons for real values, unused dummy arguments in subroutines and potential 0 indices into arrays (in all cases, if statements prevented this from happening).
  - For more information: https://github.com/njoy/NJOY2016/blob/fix/ciemat/ReleaseNotes.md
- NJOY2021
  - ACEtk development progress:
    - correcting ACE LAW=61 and 67 (we misinterpreted the data layout in the XSS array)
    - added constructors and the underlying logic to completely stitch together an ACE file from its' individual components. This now allows us to produce our own perturbed continuous energy ACE files (e.g., increasing a reaction's cross section by a few percent in a given energy region, etc.) which are accepted and run in MCNP.
    - tested reading all ACE files from the endf71 ACE library (about 2000 ACE files) and the Lib80x ACE library (about 4000 ACE files) and they all pass except for the Lib80x B10 files. These files seem to contain an ACE LAW=0 that should not make it in the ACE file. The ENDF/B-VIII.0 B10 file has actually been the subject of an errata that should solve this issue. It might be that the B10 files were produced before the errata file was released. The current version of NJOY2016 will actually prevent an ACE file with LAW=0 to be produced but that check did not exist when the Lib80x library was generated, and the LAW=0 was not detected in checkACE after the library was produced
  - ENDFtk development progress:
    - added support for LCOMP=0 and LCOMP=1 resonance covariance formats

- AM3 - Development of an Adaptive-in-temperature Method for fast on-the-fly Sampling of Thermal Neutron Scattering Data in MCNP6 (RPI)
  - Understood temperature effect on phonon spectrum of hydrogen (H) in water (H2O).
  - Generated S(alpha, beta) values based on ENDF/B VIII.0 for H in H2O, and evaluated cumulative distribution functions (CDFs) of beta and alpha at different temperature using NJOY.
  - Developed temperature dependent data library of beta and alpha at different CDF values for H in H2O, and formatted them to allow the direct use in MCNP6 for on-the-fly sampling.
  -
- AM4 – S/U Comparison Study with a Focus on USLs
  - In collaboration with IRSN and ORNL, identified application cases for closer USL comparison with select benchmarks. Completed input files not already in benchmark suite, prepared preliminary results using Whisper-1.1.
- AM5 - Proposed Benchmark Intercomparison Study
  - Completed revisions to several input files based upon discrepancies identified by IRSN. Sent MCNP6 results for ENDF/B-VIII.0 to IRSN, incorporating revisions and previous feedback as well as updates to ENDF/B-VIII.0.
- AM7 - Incorporation of Benchmark Experiment Correlations into the Whisper Nuclear Criticality Safety Software (University of Michigan)
  - Modified Whisper version is being finalized with clean version and diff version being developed for transmission to LANL.

PUBLICATIONS

Any publications created during the quarter should be submitted to Marsha Henley, 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	M.E. Rising, C.J. Josey, J.A. Kulesza, A.R. Clark, D. Timmons, and J.L. Alwin, "Improved Verification and Validation Testing and Tools including Nuclear Criticality Safety Applications with the MCNP6.3(R) Code," submitted to Nuclear Criticality Safety Division Topical Meeting (NCSD 2022), Los Alamos Report, **LA-UR-21-30313** (2021).	Yes	
Q1	J.L. Alwin, J. Clarity, F. Fernex, L. Leal, N. Leclaire, B.J. Marshall, M.E. Rising, K. Spencer, M.R. MacQuigg, and E. Saylor, "Sensitivity/Uncertainty Comparison Study Involving IRSN, LANL, and ORNL Tools to Support Validation," submitted to Nuclear Criticality Safety Division Topical Meeting (NCSD 2022), *Los Alamos Report*, **LA-UR-21-30153** (2021).	Yes	
Q1	J.L. Alwin, J.D. Hutchinson, N.A. Kleedtke, A.R. Clark, T.E. Cutler, W. Haeck, R.C. Little, D. Neudecker, M.E. Rising, T.A. Smith, and N.W. Thompson, "Investigating Fission Reaction Rate Ratio Sensitivities," submitted to Nuclear Criticality Safety Division Topical Meeting (NCSD 2022), Los Alamos Report, **LA-UR-21-30259** (2021).	Yes	

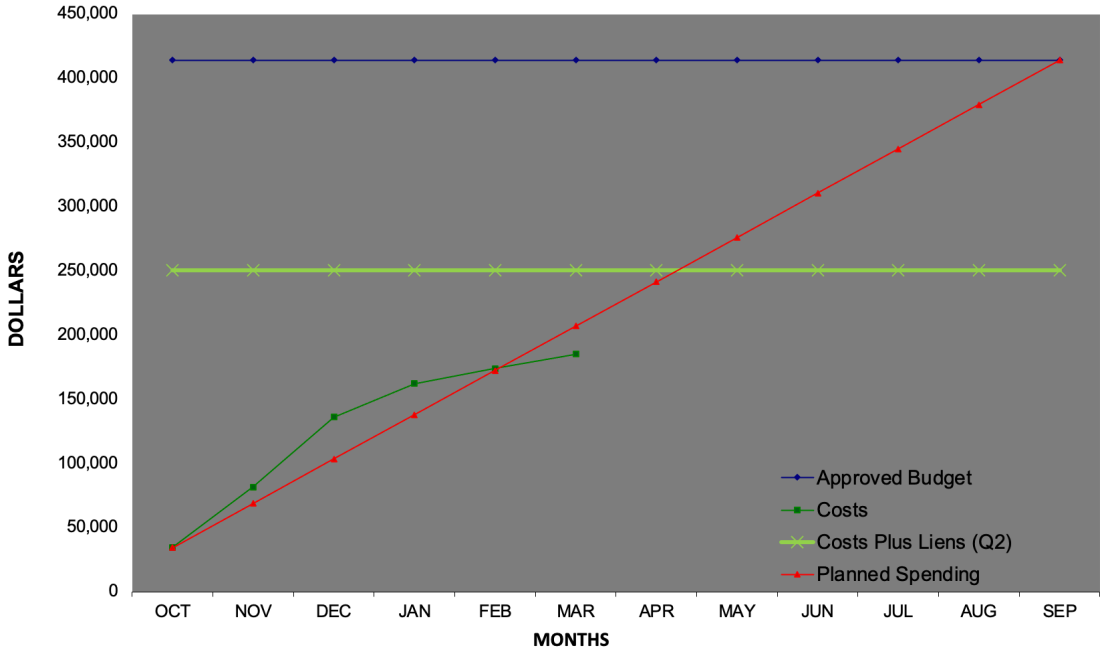
Q1	M.E. Rising and A.R. Clark, "Development of a New Fixed-source Sensitivity Tally Capability in the MCNP(R) Code," submitted 15th International Conference on Nuclear Data for Science and Technology (ND2022), *Los Alamos Report*, **LA-UR-21-30306** (2021).	Yes	
Q1	T.E. Cutler, J.D. Hutchinson, D. Neudecker, W. Haeck, A.R. Clark, and M.E. Rising, "Reactivity Coefficient Measurements and Sensitivity Studies," submitted to Nuclear Criticality Safety Division Topical Meeting (NCSD 2022), Los Alamos Report, **LA-UR-21-30075** (2021).	Yes	
Q2	J.L. Alwin, R.C. Little, M.R. MacQuigg, M.E. Rising, N. Leclaire, F. Fernex, L. Leal, E. Saylor, J. Clarity, B. J. Marshall, and K.D. Spencer, "Sensitivity/Uncertainty Comparison Study Involving IRSN, LANL, and ORNL Tools to Support Validation," submitted to the American Nuclear Society (ANS) Nuclear Criticality Safety Division (NCSD) Topical Meeting, Los Alamos Report **LA-UR-22-20941**.	Yes	
Q2	J.D. Hutchinson, A.R. Clark, N.A. Kleedtke, M.E. Rising, R.G. Sanchez, and R.A. Weldon, "Equivalent Fundamental-Mode Source Simulations for Spherical Uranium and Plutonium Systems," submitted to the American Nuclear Society (ANS) Nuclear Criticality Safety Division (NCSD) Topical Meeting, Los Alamos Report **LA-UR-22-20752**.	Yes	
Q2	J.D. Hutchinson, J.L. Alwin, A.R. Clark, T.E. Cutler, M.J. Grosskopf, W. Haeck, M.W. Herman, N.A. Kleedtke, J.R. Lamproe, R.C. Little, I.J. Michaud, D. Neudecker, M.E. Rising, T.A. Smith, N.W. Thompson, and S.A. Vander Wiel, "EUCLID: Experiments Underpinned by Computational Learning for Improvements in Nuclear Data," presented at the NCSP Technical Program Review, Feb. 16, 2022, Los Alamos Report **LA-UR-22-21097**.	Yes	
Q2	M.E. Rising, J.L. Alwin, J.C. Armstrong, S.R. Bolding, F.B. Brown, J.S. Bull, A.R. Clark, R.A. Forster, T.S. Grieve, C.J. Josey, J.A. Kulesza, R.C. Little, M.R. MacQuigg, S. Swaminarayan, and J.E. Sweezy, "FY21 MCNP(R) Updates for the Nuclear Criticality Safety Program," presented at the NCSP Technical Program Review, Feb. 15, 2022, Los Alamos Report **LA-UR-22-21049**.	Yes	
Q2	M.E. Rising, C.J. Josey, and W. Haeck, "Thermal Neutron Scattering Improvements and Fixes for MCNP6.3," presented at the NCSP Technical Program Review Analytical Methods Working Group, Feb. 14, 2022, Los Alamos Report **LA-UR-22-21067**.	Yes	
Q2	M.E. Rising, J.L. Alwin, A.R. Clark, M.R. MacQuigg, B. Riedel, "Nuclear Data Adjustment with Whisper for Criticality Safety Applications," presented at the Workshop for Applied Nuclear Data Activities (WANDA 2022), Feb. 28 - Mar. 4, 2022, Los Alamos Report **LA-UR-22-21216**.	Yes	
Q2	N.N. Calhoun, K.W. Glover, A.S. Bowles Tomaszewski, J.A. Alwin, W.J. Crooks, C.M. Perfetti, "University Pipeline (with UNM) for Criticality Safety Professionals," presented at the NCSP Technical Program Review, February 15, 2022, Los Alamos Report **LA-UR-22-21051.**	Yes	
Q2	R. Bulso, J.L. Alwin, R. MacQuigg, R. Sartor, J. Arthur, W. Haeck, "Verification of MCNP Critical Benchmark Model of U233-COMP-THERM-004," submitted to the American Nuclear Society (ANS) Nuclear Criticality Safety Division (NCSD) Topical Meeting. Los Alamos Report **LA-UR-22-20686.**	Yes	
Q2	K.E. Aldrich, J.L. Alwin, D.M. Vu, L.A. Worl, J.N. Cross, et al. "Experimental Steps toward a Density Law for Chlorine-Crediting Criticality Models of Aqueous Plutonium solutions", submitted to the American Nuclear Society (ANS) Nuclear Criticality Safety Division (NCSD) Topical Meeting, Los Alamos Report **LA-UR-22-20837**.	Yes	

Q2	D. Wise, K. D. Y. Spencer, B.J. Madahar, J.L. Alwin, W. Haeck, "Validation of MCNP Critical Benchmarks Models of Highly Enriched Uranium Cylinders", submitted to the American Nuclear Society (ANS) Nuclear Criticality Safety Division (NCSD) Topical Meeting, Los Alamos Report **LA-UR-22-20245**.		
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: AM2, 3, 4, 5 **M&O Contractor Name**: LLNL **Point of Contact Name:** Catherine Percher **Point of Contact Phone:** (925) 579-4226	**Reference:** DP0909010 **Date of Report:** April 15, 2022

BUDGET



1. Carryover into FY 2022 = $ 88,109
2. Approved FY 2022 Budget = $327,000
3. Total FY 2022 budget w/Carryover = $ 415,109
4. Actual spending for 1st Quarter FY 2022 = $136,190
5. Actual spending for 2nd Quarter FY 2022 = $ 49,049 ($65,128 liens)
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $ 35,000 (8%)

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 on Multi-Physics methods for simulation of criticality excursions (AM2)		
Q1	Provide status on slide rule application (AM3)		

Q1	Provide a status report on generating a draft document defining the TNSL code or software interface. (AM4)		
Q1	Provide status on proposed intercomparison study (AM5)		
Q2	Provide status on Multi-Physics methods for simulation of criticality excursions (AM2)		
Q2	Provide status on slide rule application (AM3)		
Q2	Provide a status report on generating a draft document defining the TNSL code or software interface. (AM4)		
Q2	Provide status in NCSP Quarterly Progress Report (AM5)		
Q3	Provide status on Multi-Physics methods for simulation of criticality excursions (AM2)		
Q3	Provide status on slide rule application (AM3)		
Q3	Provide a status report on generating a draft document defining the TNSL code or software interface. (AM4)		
Q3	Provide status in NCSP Quarterly Progress Report (AM5)		
Q4	Provide status on Multi-Physics methods for simulation of criticality excursions (AM2)		
Q4	Provide status on slide rule application (AM3)		
Q4	Provide a status report on generating a draft document defining the TNSL code or software interface. (AM4)		
Q4	Provide status in NCSP Quarterly Progress Report (AM5)		

ACCOMPLISHMENTS

- AM2 – Multi-Physics Methods for Simulation of Criticality Excursion
  - A simplified multi-physics simulation model is in development. Detailed part drawings were requested from LANL in Q1 for development of a high-fidelity simulation model.
- AM3 – Slide Rule Application

- Johann Herth presented "Status of the Slide Rule Update, Phase 4: Plutonium Configurations – Delayed Gamma," at the TPR on February 16, 2022, which demonstrated that the DFG dose rate calculations by each laboratory are now producing generally consistent results. For case 2, LLNL provided the gamma multiplicity, spectra, and detailed nuclide inventory to assist in understanding the most discrepant result. A summary of these results will be published at the ANS NCSD Topical Meeting in Anaheim, CA, in June 2022.

- AM4 - Thermal Scattering and Self-Shielding in GNDS/FUDGE
  - The thermal scattering law format specification has been completed in GNDS-2.0 including the new LTHR=3 (mixed elastic) format. FUDGE now supports multiple methods for getting processed FUDGE results into transport codes including GNDS with GIDI+, ACE format, new ENDL format, and legacy ENDL format in addition to independent processing with SABtoCOG. A detailed summary of these accomplishments together with a status report on issues with the unresolved resonance region was presented by Caleb Mattoon in LLNL-PRES-828123, "TNSL improvements in FUDGE," at the TPR on February 15, 2021.
- AM5 - Proposed Benchmark Intercomparison Study
  - 10 Special Actinide benchmarks were completed, bringing the total to 3,393 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	21

PUBLICATIONS

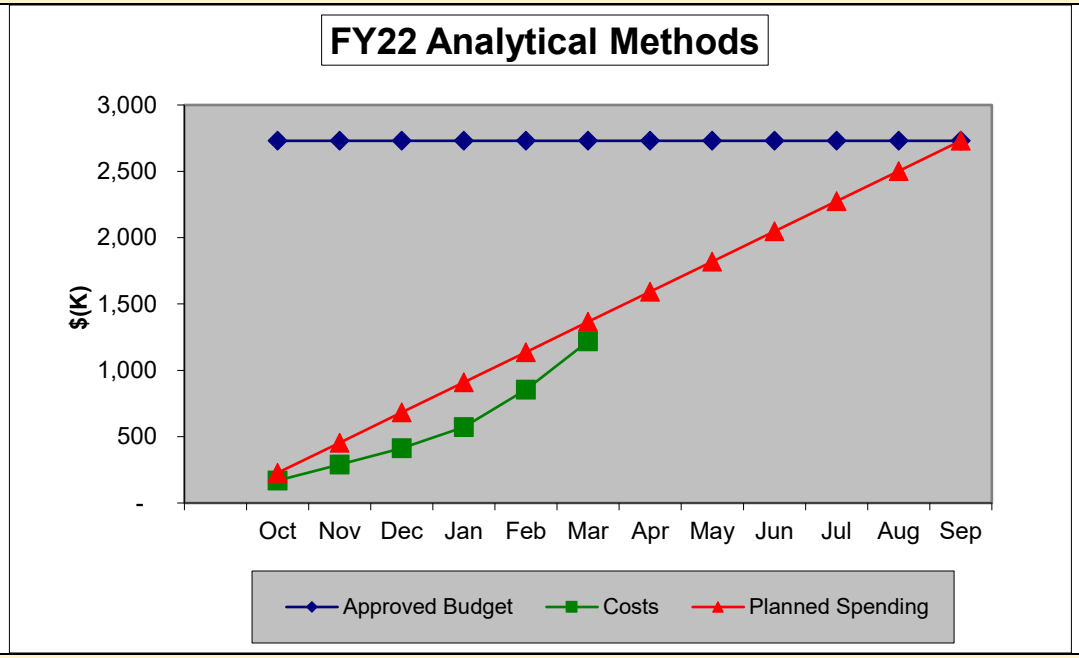
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

Quarter	Publication Reference	Sent to NCSP? Yes/no	If no, status of submittal
Q1	C. M. Mattoon et al., "Thermal Neutron Scattering Law (TNSL) Implementation and Testing in FUDGE," LLNL-TR-828141, October 15, 2021	Yes	
	C. M. Mattoon, "TNSL improvements in FUDGE," LLNL-PRES-828123, October 19, 2021	Yes	
	M. Vorabbi, "Unifying the URR PT approaches and covariance work in a consistent framework," November 15, 2021	No	BNL to provide.
Q2	Dave Heinrichs et al., "LLNL Analytical Methods Update," LLNL-PRES-831683, February 15, 2022.	Yes	
	C. M. Mattoon, "TNSL improvements in FUDGE," LLNL-PRES-828123, February 15, 2022.	Yes	
	J. Herth et al., "Status of the Slide Rule Update," February 16, 2022.	Yes	Provided by IRSN
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: AM1, 2, 3, 6, 10, 15, 17, 18, 19 **M&O Contractor Name**: ORNL **Point of Contact Name:** Doug Bowen **Point of Contact Phone:** (865) 576-0315	**Reference:** DP0909010 **Date of Report:** April 18, 2022

BUDGET



1. Carryover into FY 2022 = $235K
2. Approved FY 2022 Budget = $ 2,495K
3. Total FY 2022 Budget w/Carryover = $2,730K
4. Actual spending for 1st Quarter FY 2022 = $413K
5. Actual spending for 2nd Quarter FY 2022 = $806K
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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)		
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 SCALE/KENO/TSUNAMI maintenance and support activities (AM2)		
Q1	Provide status on AMPX maintenance and modernization activities (AM3)		
Q1	Provide status on Slide Rule application activities (AM6)		
Q1	Provide status on proposed benchmark intercomparison study activities (AM10)		
Q1	Provide status on effects of temperature on propagation of nuclear data uncertainty in calculations (AM15)		
Q1	Provide status on VALID activities (AM17)		
Q1	Provide status on determination of appropriate integral parameters for critical experiment (AM18)		
Q1	Provide status on analysis of Sum-of-Fractions for Nuclide Mixtures (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 SCALE/KENO/TSUNAMI maintenance and support activities (AM2)		
Q2	Issue an annual SCALE maintenance report to the NCSP Manager. (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 effects of temperature on propagation of nuclear data uncertainty in calculations (AM15)		
Q2	Provide status on VALID activities (AM17)		
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 SCALE/KENO/TSUNAMI maintenance and support activities (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 effects of temperature on propagation of nuclear data uncertainty in calculations (AM15)		
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)		
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 SCALE/KENO/TSUNAMI maintenance and support activities (AM2)		
Q4	Publish annual newsletter to users to communicate software updates, user notices, generic technical advice, and training course announcements. (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 AMPX maintenance and modernization activities (AM3)		
Q4	Provide status on Slide Rule application activities (AM6)		
Q4	Provide status on proposed benchmark intercomparison study activities (AM10)		
Q4	Provide status on effects of temperature on propagation of nuclear data uncertainty in calculations (AM15)		
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 856 software packages.
  - 201 SCALE, 375 MCNP®, and 0 COG packages distributed.
  - RSICC quarterly report issued.
  - Note: More than 40% of the distributions of MCNP® and SCALE are to U.S. university students in nuclear engineering department or programs.
  - Quarter 1: University Requests 406; NCSP Direct Requests 14
  - Quarter 2: University Requests – 391; NCSP Direct Requests 31

FY2022 University Distributions		
Month	MCNP®	SCALE
October	89	24
November	59	41
December	36	16
January	102	74
February	161	75
March	112	52
April		
May		
June		
July		
August		
September		
Total	559	282

- AM2 - SCALE/KENO/TSUNAMI Maintenance and Support/Cross-Section Generation/Modernization/etc.
  - Coordination
    - Continued SCALE 6.3.0 manual and export control review
    - Attended/participated in TPR
    - Continued to collect feedback for WPNCS SG-8 report, leading "Preservation of Expert Knowledge and Judgement Applied to Criticality Benchmarks (SG-8)" (https://code.ornl.gov/ww5/wpncs-sg8-feedback-form), email to ww5@ornl.gov
    - Preparations for SCALE Users' Group Hybrid meeting April 2022
    - Established new Release Coordinator position (Shane Hart) to streamline releases and deployments
  - Infrastructure and Modernization
    - Increased disk space and number of virtual machines allocate for SCALE continuous integration and testing—goal to have all tests (>3000 individual on Mac+Windows+Linux platforms) complete in less than an hour (this effort brought time down from 8->7 hours approximately)

        - Progress on moving legacy configuration system (TriBITS) to modern cmake which enables easier builds and deployments on more systems
        - Progress on moving legacy embedded dependencies (such as LIBPNG to render KENO plots) to more modern alternatives
    - Development
        - Initiated VADER trending analysis code manual improvements (many more examples) and open repository of examples
        - Initiated Sampler-based search for max/min, initial grid search followed by detailed adaptive search to determine e.g. moderator density that maximizes keff
        - Initiated automated direct perturbation calculations from within SCALE to verify sensitivity coefficients

- AM3 - AMPX Maintenance & Modernization
    - Underlying physics of new mixed-elastic scattering thermal neutron scattering format were implemented. Work on reading in new format & ensuring backwards compatibility ongoing.
    - Angular gridding scheme implemented to fix cryogenic moderator processing was found to be prohibitively slow for non-cryogenic materials. Investigation into ways to improve this without undoing the fix for cryogenic moderators are ongoing.
    - Generated new MG libraries with 258 neutron groups and 62 neutron groups for ENDF/B-VII.1 and ENDF/B-VIII.0 with a thermal cut-off of 10 eV (previously SCALE MG libraries had thermal cut-off of 5 eV, due to a limitation in the shielding calculation in SCALE). This makes the libraries consistent with the 10-eV thermal cut-off used for our CE libraries. The libraries are currently undergoing testing.
    - Added an initial version to write covariance information in File 33 (previously AMPX could read but not write this information). This is to be used to write cross section covariance information in the unresolved range, as the covariance information in File 32 does not have enough fidelity in the URR.

- AM6 – Slide Rule Application
    - This quarter, the IRSN was the lead on writing and submitting two papers to the NCSD 2022 conference concerning the work performed during FY21 and FY22 Q1. ORNL helped review both papers but have not heard if the papers were accepted.

- AM10 – Proposed Benchmark Intercomparison Study
    - Work included comment resolution and finalization of NCSD papers
    - Other work included continuing reviews of existing benchmarks for addition to the VALID database and thus inclusion in intercomparison study

- AM15 – The Effects of Temperature on the Propagation of Nuclear Data Uncertainty in Nuclear Criticality Safety Calculations
    - Produced library of temperature dependent covariances at infinite dilution for isotopes U233, U234, U235, U238, and Pu239
    - Implemented total monte carlo framework for verifying sensitivity methods: sampling of possible set of resonance parameters into an ENDF file, creation of an AMPX library, running KENO monte carlo simulation, and parsing results
    - Improved BWR assembly reference case for comparison of temperature covariance methods

- AM17 – Expansion of the Verified, Archived, Library of Inputs and Data (VALID)
  - Limited time spent on this task in Q2 given funding constraints in the CR and beyond
  - Completing reviews of proposed VALID expansion models

- AM18 – Determination of Appropriate Integral Parameters for Critical Experiment
  - No work was performed on this task in Q2 due to staff availability issues. Work will commence in Q3.

- AM19 – Analysis of Sum-of-Fractions for Nuclide Mixtures
  - PNNL is continuing its portion of the work scope. The current plan is to come up with the USL from the big three (U-233, U-235, and Pu-239), run cases with each of the actinides at that USL, then divide the mass in half of those actinides to represent a subcritical mass limit for the individual actinides. Then, run all the mixtures at those halved masses to ensure that we don't exceed the USL. PNNL has sent ORNL a few cases with the individual actinides at optimal moderation and full reflection to get a rough idea of what USL you might be able to obtain. If you all are finding that you can come up with reasonable USLs for those actinides, then perhaps we can adjust the plan. In Q2, ORNL has not been able to progress yet, as most of the scope is with PNNL at this stage.

PUBLICATIONS

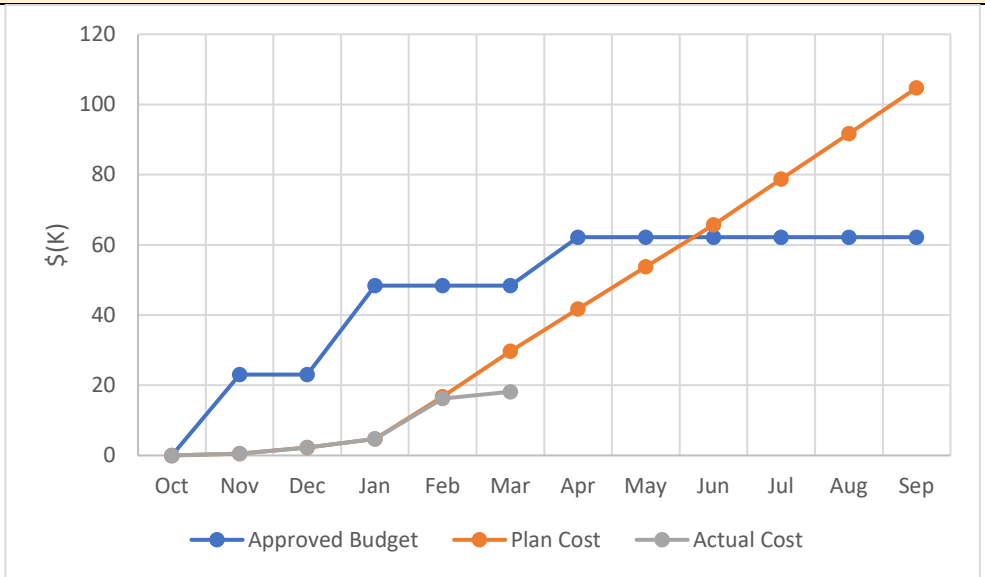
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

Quarter	Publication Reference **Example:** Author, "Title", LA-UR-18-27731, October 1, 2019	Sent to NCSP? Yes/no	If no, status of submittal
Q1	Pulled from ORNL RES system	yes	
Q2	William B.J. Marshall, Travis Greene, "Cumulative χ2 Metric for VALID for ENDF/B-VII.1 and ENDF/B-VIII.0 in SCALE 6.3b9," Transactions of the American Nuclear Society, 125, 696-699, (December 2021)	yes	
Q2	William B.J. Marshall, Travis Greene, "Cumulative χ2 Metric for VALID for ENDF/B-VII.1 and ENDF/B-VIII.0 in SCALE 6.3b9," ANS Winter Meeting (virtual), November 2021	Yes	
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: AM1 **M&O Contractor Name**: PNNL **Point of Contact Name:** Travis Zipperer **Point of Contact Phone:** (206) 528-3474	**Reference:** DP0909010 **Date of Report:** April, 2022

BUDGET



1. Carryover into FY 2022 = $ 0
2. Approved FY 2022 Budget = $120,000
3. Total FY2022 Budget w/Carryover = $120,000
4. Actual spending for 1st Quarter FY 2022 = $2,286
5. Actual spending for 2nd Quarter FY 2022 = $18,151
6. Actual spending for 3rd Quarter FY 2022 =
7. Actual spending for 4th Quarter FY 2022 =
8. Projected carryover into FY 2023 =

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 of Sum-of-Fractions analysis for nuclide mixtures (AM1)		
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)		

ACCOMPLISHMENTS

- AM1 – Analysis of Sum-of-Fractions for Nuclide Mixtures
  - Computed critical mass curves for actinides: U-232, U-233, U-234, U-235, Np-237, Pu-236, Pu-238, Pu-239, Pu-240, Pu-241, Pu-242, Am-241, Am-242m, Am-243, Cm-242, Cm-243, Cm-244, Cm-245, Cm-246, Cm-247, Cf-249, Cf-251.
  - Developed tool to compute critical mass curves of actinide mixtures.
  - Held monthly meetings between PNNL and ORNL teams to discuss progress, share information, and maintain engagement.

PUBLICATIONS

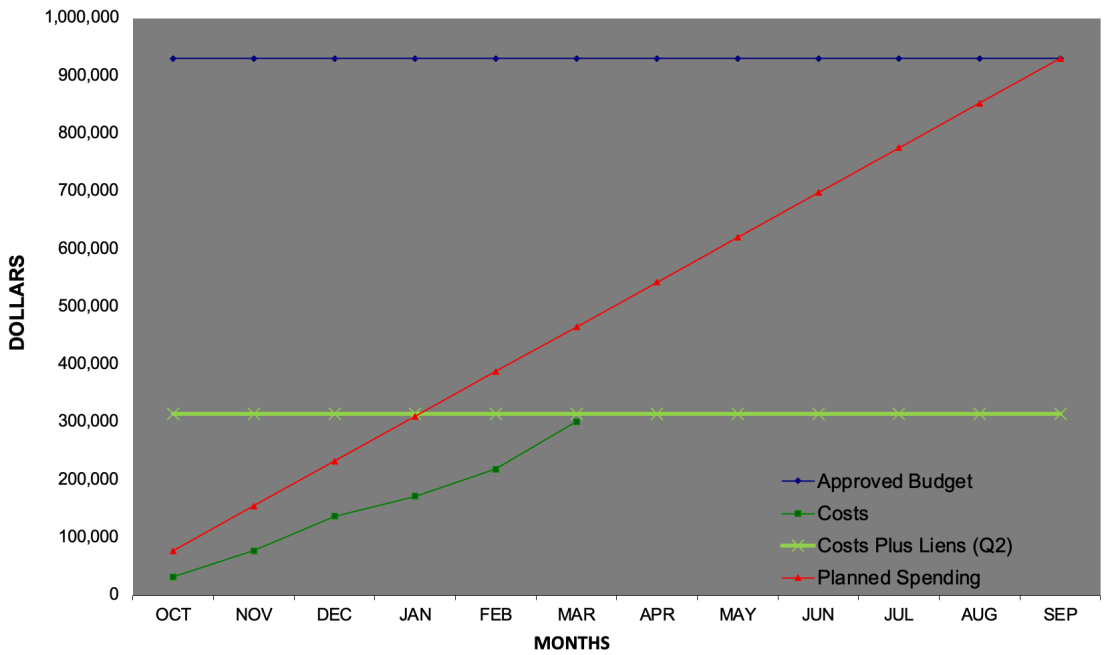
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

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	N/A		
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: IPD1, 2, 5, 6, 7 **M&O Contractor Name**: LLNL **Point of Contact Name:** Catherine Percher **Point of Contact Phone:** (925) 579-4226	**Reference:** DP0909010 **Date of Report:** April 15, 2022

BUDGET



1. Carryover into FY 2022 = $51,366
2. Approved FY 2022 Budget = $879,000
3. Total FY 2022 Budget w/Carryover = $ 930,366
4. Actual spending for 1st Quarter FY 2022 = $ 136,905
5. Actual spending for 2nd Quarter FY 2022= $ 164,319 ($13,128 liens)
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $ 77,500 (8%)

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)		The 2020 edition of the ICSBEP Handbook will be published by February 2022.

NCSP Quarterly Progress Report (FY-2022 Q2)

Q1	Provide status reports on LLNL participation in US and International IPD collaborations (including ICSBEP). (IPD1)		
Q1	Maintain, operate, and modernize the NCSP website, databases, and provide user assistance as required. (IPD2)		
Q1	Provide status report on IT support at NNSS (IPD5)		
Q1	Provide status report on benchmark evaluation of LLNL 'Pulsed Spheres' (IPD6)		
Q1	Provide the NCSP manager an update of NDA website support. (IPD7)		
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 for the evaluation of the LLNL "Hot Box" for inclusion in the ICSBEP Handbook. (IPD4)		
Q2	Provide status report on IT support at NNSS (IPD5)		
Q2	Provide status report on benchmark evaluation of LLNL 'Pulsed Spheres' (IPD6)		
Q2	Provide the NCSP manager an update of NDA website support. (IPD7)		
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 for the evaluation of the LLNL "Hot Box" for inclusion in the ICSBEP Handbook. (IPD4)		
Q3	Provide status report on IT support at NNSS (IPD5)		
Q3	Provide status report on benchmark evaluation of LLNL 'Pulsed Spheres' (IPD6)		
Q3	Provide the NCSP manager an update of NDA website support. (IPD7)		
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 for the evaluation of the LLNL "Hot Box" for inclusion in the ICSBEP Handbook. (IPD4)		
Q4	Provide status report on IT support at NNSS (IPD5)		
Q4	Provide status report on benchmark evaluation of LLNL 'Pulsed Spheres' (IPD6)		
Q4	Provide the NCSP manager an update of NDA website support. (IPD7)		

ACCOMPLISHMENTS

- IPD1 - Conduct ICSBEP for Benchmarks of the 5-Year Plan and publish annual revision to the Handbook
  - Three new NCSP evaluations approved at the 2021 ICSBEP meetings are working to address TRG comments:
    (a) HEU-MET-INTER-011, CURIE: 235U Unresolved Resonance Region Experiment, Jeff Favorite (LANL)
    (b) HEU-MET-MIX-021, TEX-HEU Baseline Assemblies: HEU Plates with Polyethylene Moderator and Polyethylene Reflector, Jesse Norris (LLNL)
    (c) FUND-ORELA-ACC-GRAPH-PNSDT-001, Benchmark of Neutron Thermalization in Graphite Using the Slowing-Down-Time ORELA Experiment, Ayman Hawari (NCSU)
  - Four new and one legacy NCSP evaluations are in preparation for the 2022 ICSBEP meeting:
    (d) ALARM-REAC-SST-SHIELD-001, Neutron Fluence and Element 57 Dose Responses to a Bare and Steel-Reflected Pulse of the ORNL HPRR, M. Dupont (ORNL)
    (e) IER305, 7uPCX fuel with Mo sleeves (SNL)
    (f) IER441, Epithermal 7uPCX lattices

(g) IER480, Pu ZPPR benchmark optimized for Polyethylene and Lucite thermal scattering, Catherine Percher (LLNL)
(h) IER488, HEU Critical and Subcritical Measurements (LANL)
- LLNL nominated Catherine Percher as a candidate for ICSBEP Chair.

- IPD2 - Maintain the NCSP Website and Systems
  - Completed ncsp.llnl.gov conversion to Drupal.
  - Updated documents, links, calendars, taskings, newsletters, photos/portraits, created art for updated banners.
  - 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.
  - Ran and provided various analytics reports.
  - Transitioning T&E course registration to Cvent site to prevent further cyberattacks.
    - One is ready just waiting on input re: Country of Citizenship from NCSP Manager to proceed.
    - Once the above is finished, the remainder will be duplicated and deployed with adjustment of the dates.
- IPD5 - IT Support at NNSS
  - Provided OISSO and ISSO 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.
  - Completed NSA/NNSA data call for NTS-SLAN, submitted to LANL OCIO office.
  - Submitted approval request for new AISSO for NTS-SLAN, conducting training to assume ISSO duties.
  - Performed equipment inspections for NCERC classes (IER 543; IER 466; IER 561).
  - Upgraded NTS-SLAN workstations to latest Windows 10 version; updated profile software on NTS-SLAN server.
  - Working with LANL network to schedule install of network equipment to address throughput issues.
  - Installed network printer for NCERC operations and classified label printer for NTS-SLAN.
  - Conducted NTS-SLAN Contingency Plan test – report to be submitted by April 13 to OCIO office.
  - Installed new key for encryptors for NTS-SLAN.
  - Conducting training for replacement System Administrator for NTS-SLAN.
- IPD6 - Benchmark Evaluation of LLNL 'Pulsed Spheres'
  - The status of this proposed SINBAD benchmark was reported at the 2021 ANS Winter Meeting on December 1, 2021 – see Publications for Q1. The first round of internal review has been completed and the evaluator is working to address reviewer comments.
  - OECD NEA established a GitLab maintenance repository for SINBAD at https://git.oecd-nea.org. An up-to-date SINBAD license is required for access.
- IPD7 - LLNL - NDA Website Support
  - Maintenance and minor updates to site.
  - Area of growing focus for LLNL, LANL, and AWE due to regulatory interest

PUBLICATIONS

Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

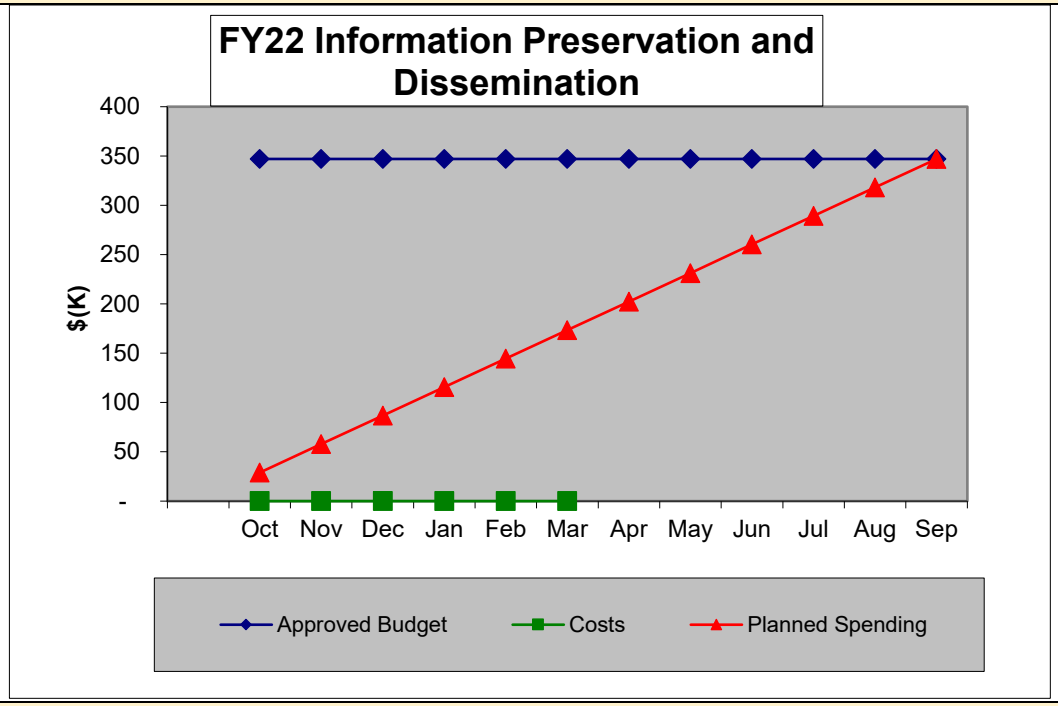
Quarter	Publication Reference	Sent to NCSP? Yes/no	If no, status of submittal
Q1	Dave Heinrichs et al., "Report on the 2021 ICSBEP and SINBAD Technical Review Group (ZOOM) Meeting," LLNL-MI-829200, October 31, 2021.	Yes	

	Soon S. Kim et al., “Evaluation of Polyethylene and Blank Pulsed Sphere Experiments Using Deuteron Transport Feature in COG,” 2021 ANS Winter Meeting, December 1, 2021.	Yes	
	Dave Heinrichs et al., “Report on the Second 2021 ICSBEP/IRPhE Technical Review Group (ZOOM) Meeting,” LLNL-MI-830264, December 31, 2021.	Yes	
Q2			
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: IPD3, 5 **M&O Contractor Name**: ORNL **Point of Contact Name:** Doug Bowen **Point of Contact Phone:** (865) 576-0315	**Reference:** DP0909010 **Date of Report:** April 18, 2022

BUDGET



1. Carryover into FY 2022 = $2K
2. Approved FY 2022 Budget = $345K
3. Total Approved FY 2022 Budget w/Carryover = $347K
4. Actual spending for 1st Quarter FY 2022 = $0K
5. Actual spending for 2nd Quarter FY 2022 = $0K
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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 development of NCSP repository at OSTI.gov. (IPD3)		
Q1	Provide a status report on completion of the HPRR benchmark. (IPD5)		

Q2	Provide a status report on development of NCSP repository at OSTI.gov. (IPD3)		Two OSTI meetings have been conducted to get this back on track. The significant issue is the late arrival of FY22 funding at ORNL. OSTI also needed to update the scope statement and update labor rates in the proposal.
Q2	Provide a status report on completion of the HPRR benchmark. (IPD5)		
Q3	Provide a status report on development of NCSP repository at OSTI.gov. (IPD3)		
Q3	Provide a status report on completion of the HPRR benchmark. (IPD5)		
Q4	Provide a status report on development of NCSP repository at OSTI.gov. (IPD3)		
Q4	Provide a status report on completion of the HPRR benchmark. (IPD5)		

ACCOMPLISHMENTS

- IPD3 – Nuclear Criticality Safety Repository
  - There is not enough funding to initiate a contract with OSTI – as of this writing, ORNL has not received the remainder of FY22 funding, which has caused delays committing necessary funds to this subcontract initiate work. Two meetings have been conducted in Q2. The first meeting was done with staff from OSTI at LLNL, LANL, and in Oak Ridge where we discussed legacy issues with OSTI retrieval and discussed issues with retrieving files that are located at the sites but not in the OSTI repository (links). The first two meetings did not go smoothly but there seems to be some forward progress with respect to understanding the need at OSTI for making NCSP documents easier to find and retrieve. We discussed sending funds to OSTI from NNSA via an interagency agreement. There has been some refinement to the work scope as discussed in the proposal – ORNL received the new proposal scope Thurs., April 14, 2022.

- IPD5 – HPRR Benchmark
  - On the shielding evaluation: I prepared the presentation for the NCSP TPR and I worked a few hours on the new version of the evaluation and I was still waiting for the NEA edited document. Mathieu worked on a an NCSD paper about why we it difficult to write a good critical benchmark from the HPRR data. The paper was accepted for publication and presentation at NCSD. Mathieu intends to defend the evaluation at the next ICSBEP TRG meeting this fall.

PUBLICATIONS

Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

Quarter	Publication Reference	Sent to NCSP?	If no, status of submittal

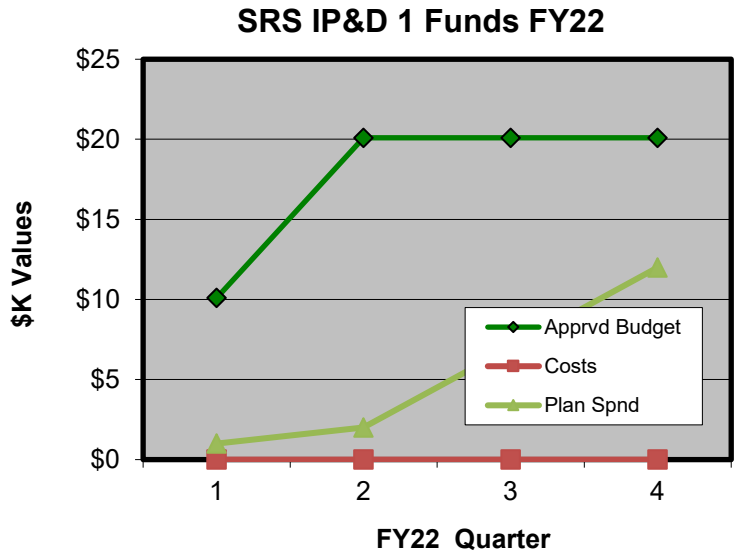
NCSP Quarterly Progress Report (FY-2022 Q2)

	Example: Author, "Title", LA-UR-18-27731, October 1, 2019	**Yes/no**	
Q1	List pulled from RESolution	Yes	
Q2	None have completed ORNL's review process. Will be sent next quarter.		
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: IPD1 **M&O Contractor Name**: SRNS **Point of Contact Name:** David Erickson **Point of Contact Phone:** 803-557-1315	**Reference:** DP0909010 **Date of Report:** April, 2022

BUDGET



1. Carryover into FY 2022 = $95
2. Approved FY 2022 Budget = $10,000 + $10K transfer from CSSG funds
3. Total FY 2022 Budget w/Carryover = $20,095
4. Actual spending for 1st Quarter FY 2022 = $0
5. Actual spending for 2nd Quarter FY 2022 = $0
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $TBD

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 progress with CritView. (IPD1)		Work in FY21 included generating 2 documents. The first documents the digitization of curves from LA-10860. The second documents new SCALE calculations. These documents are both in the review/approval stage. Once completed they will be reviewed for public release and made available to the NCSP. The information from these documents will be incorporated into an upcoming revision to the CritView database and code.

Q1	NCSP Approved Scope for FY21. (IPD1)		The Scope for FY22 is not finalized.
Q2	Provide status reports on progress with CritView. (IPD1)		These documents are both approved and have been reviewed for public release. They will be made available to the NCSP. Site/facility project priorities have made it difficult to identify time to work on database and code updates.
Q2	TBD based on Approved Scope. (IPD1)		The Scope for FY22 is not finalized.
Q3	Provide status reports on progress with CritView. (IPD1)		
Q3	TBD based on Approved Scope. (IPD1)		
Q4	Provide status reports on progress with CritView. (IPD1)		
Q4	Provide updated CritView database for user testing. (IPD1)		

ACCOMPLISHMENTS

- IPD1 – ARH-600 Reissue (CritView)
  - Completion of Documentation for SCALE Calculations related to ARH-600
  - Completion of Documentation for Digitizing Curves from LA-10860 for CritView

PUBLICATIONS

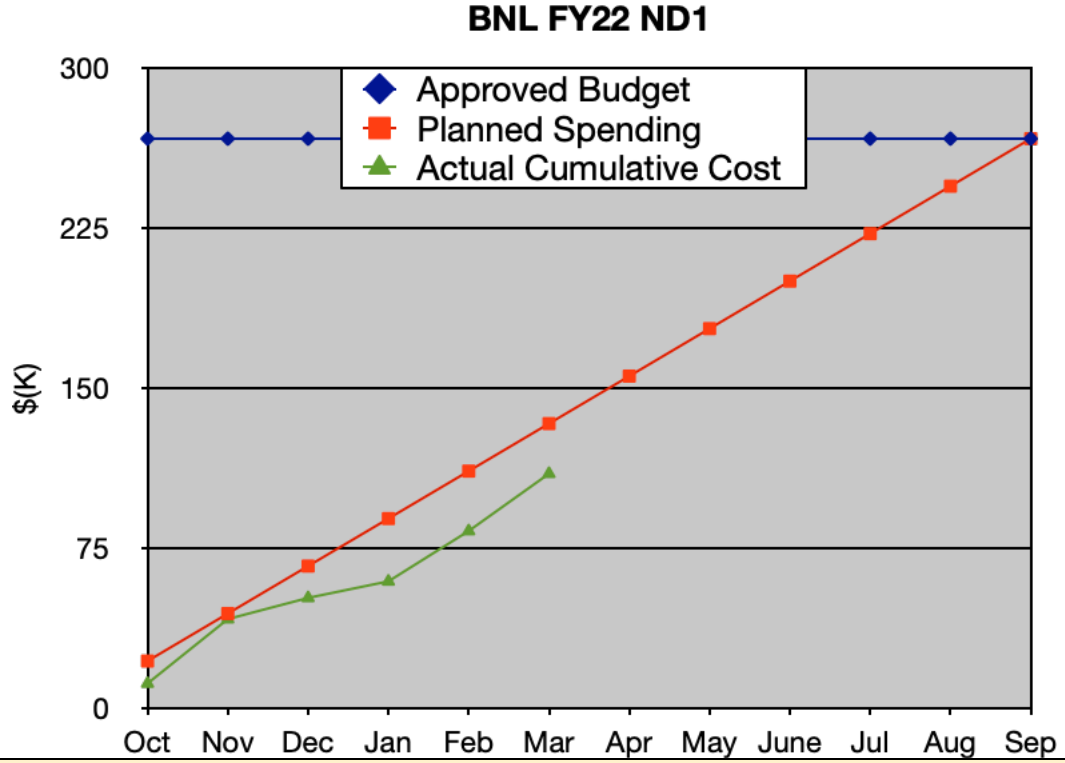
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

Quarter	**Publication Reference** **Example:** Author, "Title", LA-UR-18-27731, October 1, 2019	**Sent to NCSP? Yes/no**	**If no, status of submittal**
Q1	A.N. Rodgers, N.R. Coon, S.H. Finfrock, “SCALE Calculations Replicating ARH-600 Data”, N-NCS-G-00191, Rev. 0, February, 2022	No	Will be sent in Q3
Q2	N. Coon, A. Rodgers, D. Erickson, “Digitizing Curves from LA-10860 to be Used in CritView”, N-NCS-G-00192, Rev. 0, July, 2021	No	Will be sent in Q3
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: ND1 **M&O Contractor Name**: BNL **Point of Contact Name:** David Brown **Point of Contact Phone:** 631-344-2814	**Reference:** DP0909010 **Date of Report:** 7 April, 2022

BUDGET



1. Carryover into FY 2022 = $ 39,209
2. Approved FY 2022 Budget = $ 267,000
3. Total FY 2022 Budget w/Carryover = $306,209
4. Actual spending for 1st Quarter FY 2022 = $51,837
5. Actual spending for 2nd Quarter FY 2022 = $58,200
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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	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		Due to revised BNL cybersecurity posture, the next major upgrade to ADVANCE is delayed. In short, we are finding it difficult to connect the NNDC GitLab instance (outside of the BNL firewall) to the Kubernetes cluster (inside the firewall).

	on all nuclear data activities in the NCSP Quarterly Progress Reports. (ND1)		As a result, ADVANCE must be run "by hand", defeating the purpose of a continuous integration system. Nevertheless, build reports are being forwarded to evaluation reviewers.
Q1	If mandated by CSEWG, release new ENDF library. (ND1)		The next ENDF/B library release is postponed until 2024. However, ENDF/B beta releases were also delayed by lack of evaluation review system. An evaluation review system being piloted in Q2. Once evaluations pass this review and enter the "Phase II" branch, then validation of new evaluations can begin.
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)		The review system and interface has been now officially deployed in this quarter. Merge requests for the decay sublibrary (~520 files) have been created, being that about 13 reviews have already been concluded and successfully merged. Reviewers for the alphas, atomic relaxation, and electrons sublibraries have already been identified and agree to review the evaluated contributions. Steps were given also in the process of reviewing the impactful evaluations related to the major actinides in the neutron sublibrary: the review interface has been set up and is awaiting confirmation of the potential reviewers.
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

- ND1 - National Nuclear Data Center (NNDC) Support to the NCSP
  - We have been logging and accommodating the evaluated files submitted by the community in the appropriate repository branches of the NNDC GitLab server
  - We have also identified many issues with some evaluated files, fixing them or logging issue trackers when appropriate
  - The review procedure, system and interface has been tested, implemented, and successfully deployed, allowing for the review process to begin. The decay sublibrary for example has already had some completed reviews, while we already have reviews in process for the electrons, alphas, atomic relaxation, and the aforementioned decay sublibraries. Also, the review interfaces for 239Pu and 238U in the neutron sublibrary have already been created and set up.
  - We are in the final stages of concluding the 2021 CSEWG Meeting minutes.

PUBLICATIONS

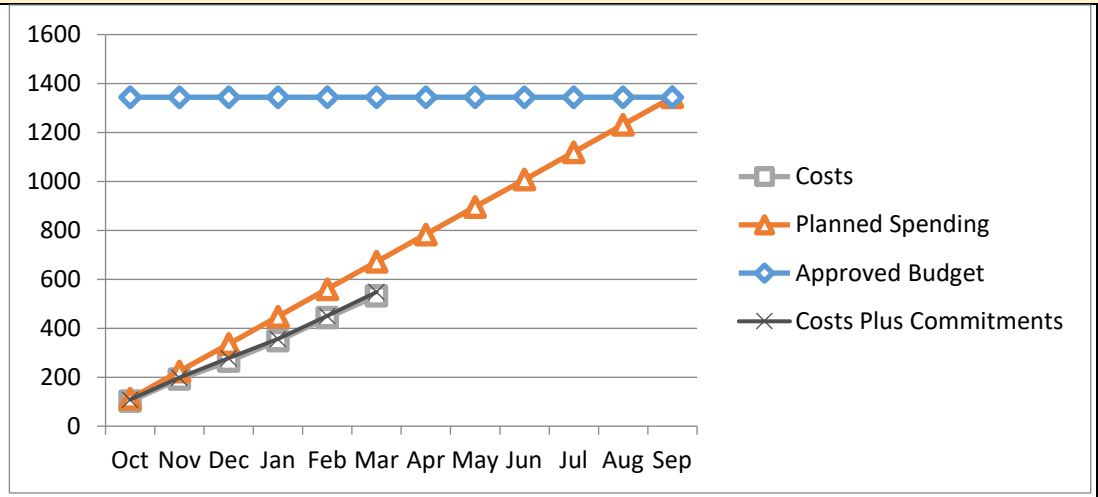
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

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-2022 Q2)

NCSP Element and Subtask: ND1, 2, 3 **M&O Contractor Name**: LANL **Point of Contact Name:** Joetta Goda/Bob Little/ Jen Alwin **Point of Contact Phone:** 505-667-2812/505-665-3487/505-667-7252	**Reference:** DP0909010 **Date of Report:** April 15, 2022

BUDGET



1. Carryover into FY 2022 = $25,000
2. Approved FY 2022 Budget = $ 1,319,000
3. Total FY22 Budget w/Carryover = $1,344,000
4. Actual spending for 1st Quarter FY 2022 = $265,403 (plus end of Q1 commitments of $12,188 for a total of $277,591)
5. Actual spending for 2nd Quarter FY 2022 = $267,214 for a total of $532,617 (plus end of Q2 commitments of $15,620 for a total of $548,237)
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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 report on LANL participation in US and International Nuclear Data collaborations. (ND1)		
Q1	Conduct CSEWG Evaluation and Covariance sessions. (ND1)		

Q1	Report data testing results with ENDF/B-VIII.0 and additional beta release cross sections at CSEWG. (ND1)		
Q1	Provide status report on Prompt Fission Neutron Spectra (PFNS) Measurement of Plutonium-240 (ND2)		
Q1	Provide status report on Unresolved and Fast Measurements of Uraunium-233 (n,gamma) (ND3)		
Q2	Provide status reports on LANL participation in US and International Nuclear Data collaborations. (ND1)		
Q2	Provide status report on Prompt Fission Neutron Spectra (PFNS) Measurement of Plutonium-240 (ND2)		
Q2	Provide status report on Unresolved and Fast Measurements of Uraunium-233 (n,gamma) (ND3)		
Q3	Provide status reports 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 (ND2)		
Q3	Provide status report on Unresolved and Fast Measurements of Uraunium-233 (n,gamma) (ND3)		
Q4	Provide status reports 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 status report on Prompt Fission Neutron Spectra (PFNS) Measurement of Plutonium-240 (ND2)		
Q4	Obtain final experimental results for Pu-240 PFNS at LANSCE, finalize data analysis, and deliver data to evaluators (ND2)		
Q4	Provide status report on Unresolved and Fast Measurements of Uraunium-233 (n,gamma) (ND3)		
Q4	Finalize acquisition of U-233 thick target capture data, finalize data analysis, and deliver data to evaluators (ND3)		
ACCOMPLISHMENTS			

- ND1 – Nuclear Data Evaluation and Testing
    - U-235: Finalize prompt fission neutron spectra based on LANSCE high-energy emission data from Chi-Nu (DUE FY22 Q2):
        - Milestone work was successfully finished. LANSCE experimentalists delivered in Q1 Chi-Nu experimental PFNS to our evaluator, whoincluded them in an evaluation in Q2. Validated the evaluated PFNS with pulsed spheres and keff of crits. Pulsed spheres notably improved compared to VIII.0, impact on keff is small enough to accommodate. The final evaluated PFNS were delivered to the IAEA-coordinated INDEN collaboration. The hope is that they will include them in the VIII.1 evaluation. Formal report for Q2 (LA-UR-22-22220) and release document (presentation, LA-UR-22-21516) for INDEN is attached.
    - U-235, Pu-239 "Evaluate PFNS and multiplicity consistently, including angular information about prompt neutrons" (Originally a FY21 Milestone, now DUE FY22 Q4)":
        - nu-bar: Investigated TKE parameterization and tried various variants of U-235 nu-bar priors and evaluations including different descriptions. In Q2, we finalized the U-235 nu-bar evaluation and have a release candidate (presentation, LA-UR-22-21516). The data were validated with respect to several fission quantities, and with keff of crits and pulsed spheres. We needed a little tweak. Both, the original and tweaked evaluation were provided to the INDEN collaboration for inclusion in VIII.1. Here, more questions arose, cannot promise an inclusion in VIII.1 at this point. Working on releasing a final report.
        - PFNS: Sensitivities for the PFNS for 235U(n,f) as a function of incident energy were calculated, for a handful of incident neutron energies, thermal, 1.5 MeV, 6.0 MeV, and 14.0 MeV. These sensitivities, parameter uncertainties, and baseline PFNS calculations will be used for optimization.
    - U-238: "Evaluate PFNS and multiplicity consistently, including angular information about prompt neutrons" (DUE FY22 Q4)":
        - (nu-bar) Fission barriers from CoH were optimized with respect to the ENDF/B-VIII.0 fission cross section, and these were used to update the multi-chance fission probabilities in CGMF. Sensitivities for nubar were also calculated for the various TKE parametrizations using these updated fission probabilities. These sensitivities, baseline nubar calculations, and parameter uncertainties were handed off for optimization. We have started unc. quantification of experimental data.
    - Light Nuclei
        - We have focused on ENDF MF=2 resonance parameter representations for 6Li, 9Be, and 16O. We have also been revising the experimental data decks for these extensions (for 6Li, 9Be, 16O) of existing evaluations to ensure their completeness and consistency.
    - Ta181
        - Work continued on producing realistic covariances for Ta181 evaluation in the fast neutron region. Default predictions by the Kalman filter produce uncertainties that are far too small to be credible. Various ways of overcoming this difficulty are being investigated. In addition, we plan to include cross-correlations among different reactions that requires updating related ENDF-6 formatting capabilities.
  - Validation / Data Testing
    - Validated several LANL Pu-9 test files to test data for the new VIII.1 beta-release including the newest NCSP-funded nu-bar and (n,f) cross sections. Testing is done with keffs of ~30 crits, reaction rates in Jezebel, and 3 LLNL pulsed spheres.

- A. Lovell and D. Neudecker reported evaluation progress described above for Pu-9 and U-5 nu-bar/PFNS/(n,f) cross sections at NCSP TPR (slides attached, LA-UR-22-20933).

- ND2 – Prompt Fission and Neutron Spectra (PFNS) Measurement of Plutonium-240
  - As indicated earlier, the Pu-240 PPAC was received from Livermore in mid-September (original schedule was March). Before we could take data in the beam, LANSCE suffered a major component failure that caused three-four weeks of down time. We were hopeful at that time that sufficient beam time could be obtained during the run cycle that ended in December 2021 for the experiment to happen, but warned of the risk that that might not be possible. Indeed, after considering all of the options, beam time was not made available for the Pu-240 PFNS measurement during that run cycle.
  - We did take Pu-240 spontaneous fission data with the PPAC for about three weeks. This data is required to subtract background for the PFNS measurement.
  - The plan is to obtain the PFNS data when the next run cycle begins in June 2022. We expect to take data through August. Several options are being explored to enhance the efficiency of the experiment. Because of the various delays, final data analysis will not be complete until the end of CY 2022 or early in CY 2023.
- ND3 – Unresolved and Fast Measurements of U233 (n, gamma)
  - As reported last quarter, all production data have been acquired using DANCE and NEUANCE. Data analysis continues. Events from DANCE in coincidence with events from NEUANCE have been tagged as fission events. The fission tagging method has been successfully implemented in the code, and the background studies have been performed.
  - We have been communicating with evaluators from IRSN and ORNL. We have discussed topics such as measurement technique, strengths, limitations, optimal neutron binning, and when results will be transmitted. We will continue to communicate with the evaluators. The data analysis will continue and final results of the capture to fission ratio will be provided by end of FY22.

PUBLICATIONS

Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

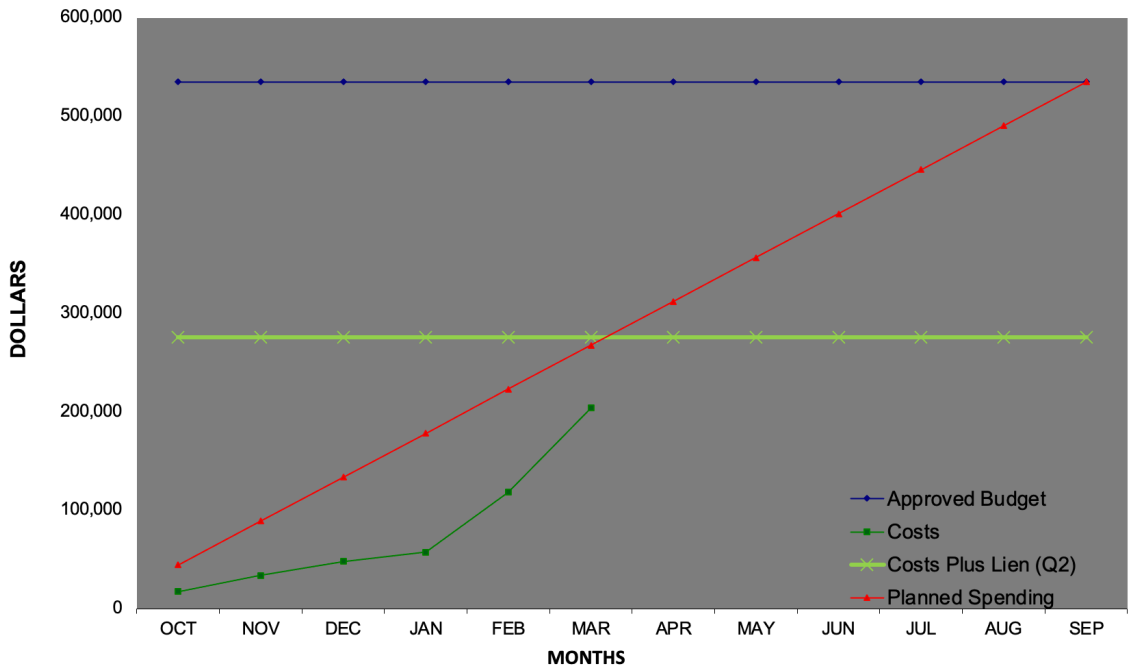
Quarter	Publication Reference **Example:** Author, "Title", LA-UR-18-27731, October 1, 2019	Sent to NCSP? Yes/no	If no, status of submittal
Q1	Amy Lovell and Denise Neudecker, “Correcting the PFNS for more consistent fission modeling,” LA-UR-21-30882, November 1, 2021.	Yes	
Q1	Matthew Mumpower and Denise Neudecker, “LANL Update to Pu-239 in the fast energy range,”LA-UR-21-31243, presented at CSEWG, November 2021.	Yes	
Q1	Denise Neudecker, “Updates from the Covariance Session Committee,” LA-UR-21-31165, presented at CSEWG, November 2021.	Yes	

Q1	Denise Neudecker, "Validating the LANL versus INDEN Pu-239 file in the fast range," LA-UR-21-31248, presented at CSEWG, November 2021.	Yes	
Q1	Ester Leal Cidoncha, Aaron Couture, and Gencho Rusev, "U-233 (n,γ) measurements at LANSCE," LA-UR-21-31520, presented at NDAG, November 2021.	Yes	
Q1	Paul E. Koehler et al., "149Sm Results from DICER Plus DANCE," LA-UR-21-31180, presented at NDAG, November 2021.	Yes	
Q1	M. Herman and T. Kawano, "Ta-181 – fast neutron evaluation," LA-UR-21-31368, presented at CSEWG, November 2021.	Yes	
Q1	G. Hale and M. Paris, "Progress on Light Element Standard Cross Sections at Los Alamos," LA-UR-21-31976, presented at Technical Meeting on Neutron Data Standards 2021 (on-line), IAEA Vienna, Austria, December 8, 2021.	Yes	
Q1	G. Hale and M. Paris, "TN update plans and advances for O-16 and Be-9," LA-UR-21-31398, presented at CSEWG, November 2021.	Yes	
Q2	Amy Lovell and Denise Neudecker, "Modeling and evaluating 239Pu and 235U PFNS and average prompt-neutron multiplicity," Presented at NCSP TPR, **LA-UR-22-20933**, February 16, 2021.	Yes	
Q2	Denise Neudecker and Kegan Kelly, "Including Chi-Nu 235U PFNS Experimental Data into an ENDF/B-VIII.1 Release Candidate Evaluation," **LA-UR-22-22220**, March 8, 2021.	Yes	
Q2	D. Neudecker, A. Lovell, K. Kelly, P. Talou "235U(n,f) PFNS and nu-bar evaluations: first release candidate including validation," **LA-UR-22-21516**, February 15, 2021.	Yes	
Q2	Amy Lovell, "Compare ν-bar parameterizations for 235U(n,f) with fitted fission barriers", **LA-UR-22-23270**, April 4, 2022	Yes	
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: ND2, 5, 7, 8, 10, 11 **M&O Contractor Name**: LLNL **Point of Contact Name:** Catherine Percher **Point of Contact Phone:** (925) 579-4226	**Reference:** DP0909010 **Date of Report:** April 15, 2022

BUDGET



1. Carryover into FY 2022 = $ 138,848
2. Approved FY 2022 Budget = $396,000
3. Total FY 2022 Budget w/Carryover = $ 534,848
4. Actual spending for 1st Quarter FY 2022 = $ 48,281
5. Actual spending for 2nd Quarter FY 2022 = $155,537* ($71,969 liens)
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $ 42,500 (8%)

***NOTE:** Does not include $12,957 for March NCSU spending which will not cost at LLNL until April.

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 on LLNL/NCSU nuclear data activities on generation and benchmarking of thermal neutron scattering sections (ND2)		
Q1	Provide status on LLNL/NCSU nuclear data activities on development and implementation		

	of modern doppler broadening approach (ND5)		
Q1	Provide status on 'Alpha-N' benchmark measurements (ND7)		
Q1	Provide status on fission TPC measurement study (ND8)		
Q1	Provide status on development and implementation of machine learning methods for thermal scattering law evaluations (ND10)		
Q1	Provide status report PPAC target fabrication progress (ND11)		Task complete.
Q1	Fabricate the Pu240 PPAC targets and fission detector components (ND11)		Task complete.
Q2	Provide status on LLNL/NCSU nuclear data activities on generation and benchmarking of thermal neutron scattering sections (ND2)		
Q2	Provide status on LLNL/NCSU nuclear data activities on development and implementation of modern doppler broadening approach (ND5)		
Q2	Provide status on 'Alpha-N' benchmark measurements (ND7)		
Q2	Provide status on fission TPC measurement study (ND8)		
Q2	Provide status on development and implementation of machine learning methods for thermal scattering law evaluations (ND10)		
Q2	Provide status report PPAC target fabrication progress (ND11)		Task complete.
Q2	Assemble and test the Pu240 fission detector (ND11)		Task complete.
Q3	Provide status on LLNL/NCSU nuclear data activities on generation and benchmarking of thermal neutron scattering sections (ND2)		

Q3	Provide status on LLNL/NCSU nuclear data activities on development and implementation of modern doppler broadening approach (ND5)		
Q3	Provide status on 'Alpha-N' benchmark measurements (ND7)		
Q3	Provide status on fission TPC measurement study (ND8)		
Q3	Provide status on development and implementation of machine learning methods for thermal scattering law evaluations (ND10)		
Q3	Provide status report PPAC target fabrication progress (ND11)		
Q4	Deliver thermal neutron scattering data evaluations as indicated in Appendix B of the 5-Year Plan. (ND2)		
Q4	Provide status on LLNL/NCSU nuclear data activities on generation and benchmarking of thermal neutron scattering sections (ND2)		
Q4	Provide status on LLNL/NCSU nuclear data activities on development and implementation of modern doppler broadening approach (ND5)		
Q4	Provide status on 'Alpha-N' benchmark measurements (ND7)		
Q4	Provide status on fission TPC measurement study (ND8)		
Q4	Provide status on development and implementation of machine learning methods for thermal scattering law evaluations (ND10)		
Q4	Provide an update on the development and testing of NeTS modules for selected materials such as light water, graphite, etc. (ND10)		
Q4	Provide status report PPAC target fabrication progress (ND11)		

ACCOMPLISHMENTS

- ND2 - Generation and Benchmarking of Thermal Neutron Scattering Cross Sections in Support of Advanced Nuclear Reactor Concepts
  - NCSU initiated evaluation considerations of paraffin (NCSP's Appendix B material for FY 2022 and 2023). Examination of the nature of this material to determine the possibility of using DFT vs. MD techniques.
  - NCSU received comments on the ORELA benchmark report from the ICSBEP reviewers and is updating the benchmark report accordingly.
- ND5 - Development and Implementation of a Modern Doppler Broadening Approach Including Atomic Binding Effects
  - NCSU completed the integration of the Doppler broadening module into the *FLASSH* code. Testing within *FLASSH* is ongoing for various materials. To date, results are consistent. Additional work to integrate the Doppler module has focused on improving the needed distributions derived from the TSL and improving the numerical stability for low temperatures. Furthermore, upgrades to the *FLASSH* ACE file evaluation have refined the differential cross section to provide numerical stability down to 5K, an improvement over traditional codes and methods. These improvements have an impact even in room temperature calculations, removing non-physical features in the angular distributions and non-physical step functions from SCT approximations.
- ND7 - 'Alpha-N' Benchmark Measurements
  - The higher-fidelity Geant4 simulation has been used to generate an improved cross-section correction for the detector that includes contributions from all analysis cuts. This cross-section along with other analysis improvements (improved particle identification and detector energy calibration) have been applied to the analysis of the Ohio University Beryllium data. Final debugging of this analysis is underway along with a comparison to the previous analysis.
- ND8 - Study: Fission TPC Measurement of the U-233/U-235 (n,f) Cross Section Ratio
  - After completing measurements at LANSCE in late 2021, the fissionTPC is in the process of being returned to LLNL for further assessment and refurbishment. A measurement of the spontaneous fission of 252Cf will be performed. The purpose of this measurement will be twofold; to assess the functioning of the complete system and to provide mockup data a reduced channel count fissionTPC. Additionally, all previous budget and planning documents from over a decade of fissionTPC operations are being complied and will assist in the production a detailed cost and work estimate of any future operations. A new analysis of 239Pu/235U data is underway, this analysis effort will provide a knowledge transfer to new staff and the cost will be similar, and therefore provide an estimate of, the cost of a 233U/235U analysis.
- ND10 – Development and Implementation of Machine Learning Methods for Thermal Scattering Law Evaluations
  - The feed forward network (FFN) for light water has been tested for producing 3-D S(α, β, T) TSL data. Integration into the evaluation process including the ability to produce TSL ENDF files is underway. Consideration of establishing NeTS capabilities for other NCSP materials is progressing.
- ND11 - Fabricate the Pu240 PPAC targets and fission detector components
  - LLNL completed fabrication and delivery in FY-2021. The 240Pu PFNS measurement was commenced at LANSCE the week of March 7, 2022, using the Li-6 glass detector array. The LLNL/LANL proposal for beam time using both the Li-6 glass and EJ309 scintillator detector arrays was provided to NCSP – see Publications.

PUBLICATIONS

Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

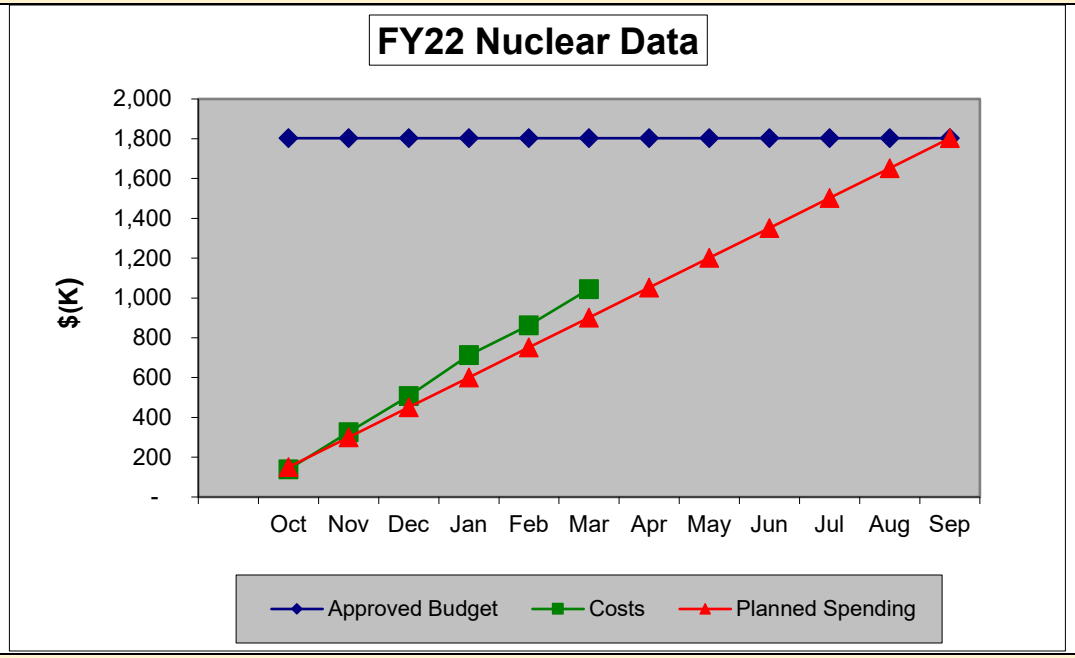
Quarter	Publication Reference **Example:** Author, "Title", LA-UR-18-27731, October 1, 2019	Sent to NCSP? Yes/no	If no, status of submittal
Q1	Jonathan Crozier, "Uranium Carbide and Uranium-Metal TSL Evaluation and Cross Sections," CSEWG Meeting, November 17, 2021.	Yes	

	Nina C. Fleming et al., "*FLASSH* 1.0: Full Law Analysis Scattering System Hub," 2021 ANS Winter Meeting and Technology Expo, December 3, 2021.	Yes	
	Lucas Snyder et al., "*Measurement of the ^{239}Pu(n,f)/^{235}U(n,f) Cross-Section Ratio with the NIFFTE fission Time Projection Chamber*" Nuclear Data Sheets 178 (2021) 1-40.	Yes	
Q2	M. Devlin, C. Y. Wu et al., *"Measurement of the ^{240}Pu(n,f) Prompt Fission Neutron Spectra with Chi-Nu,"* no date.	Yes	
	Chin-Yen Wu, Roger A. Henderson, *"Parallel-plate avalanche counter (PPAC) fabrication for 240Pu PFNS measurement,"* LLNL-PRES-831600, February 16, 2022.	Yes	
	Ayman I. Hawari, *"Accomplishments of Thermal Scattering Research at North Carolina State University,"* February 17, 2022.	Yes	
	Mateusz Monterial et al., "*Measurement of the material isotopics and atom number ratio with α-particle spectroscopy for a NIFFTE fission Time Projection Chamber actinide target*" NIM A 1021 (2022) 165864.	Yes	
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: ND1, 3, 4, 6, 10 **M&O Contractor Name**: ORNL **Point of Contact Name:** Doug Bowen **Point of Contact Phone:** (865) 576-0315	**Reference:** DP0909010 **Date of Report:** April, 2022

BUDGET



1. Carryover into FY 2022 = $221K
2. Approved FY 2022 Budget = $ 1,582
3. Total FY 2022 Budget w/Carryover = $1803K
4. Actual spending for 1st Quarter FY 2022 = $508K
5. Actual spending for 2nd Quarter FY 2022 = $537K
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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 activities in NCSP Quarterly Progress Reports (ND1)		
Q1	Provide status reports 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)		

Q1	Complete cross-section measurement and evaluation deliverables per the nuclear data schedule in Appendix B of the 5 Year Plan (ND1)		COVID-19 has delayed cross section measurements at GELINA by 12 months, that is all experiments are about 12 months behind original schedule. Appendix B will be adjusted
Q1	Provide status reports on all activities in NCSP Quarterly Progress Reports (ND3)		
Q1	Provide status reports 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 (ND3)		
Q1	Complete cross-section measurement and evaluation deliverables per the nuclear data schedule in Appendix B of the 5 Year Plan (ND3)		
Q1	Provide status reports on all activities in NCSP Quarterly Progress Reports (ND4)		
Q1	Provide status reports on all activities in NCSP Quarterly Progress Reports (ND6)		
Q1	Provide status reports on all activities in NCSP Quarterly Progress Reports (ND10)		
Q2	Provide status reports on all activities in NCSP Quarterly Progress Reports (ND1)		
Q2	Provide status reports 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 and evaluation deliverables per the nuclear data schedule in Appendix B of the 5 Year Plan (ND1)		
Q2	Provide status reports on all activities in NCSP Quarterly Progress Reports (ND3)		
Q2	Provide status reports 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 (ND3)		
Q2	Complete cross-section measurement and evaluation deliverables per the nuclear data schedule in Appendix B of the 5 Year Plan (ND3)		
Q2	Provide status reports on all activities in NCSP Quarterly Progress Reports (ND4)		
Q2	Provide status reports on all activities in NCSP Quarterly Progress Reports (ND6)		
Q2	Provide status reports on all activities in NCSP Quarterly Progress Reports (ND10)		
Q3	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports (ND1)		
Q3	Provide status reports 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 and evaluation deliverables per the nuclear data schedule in Appendix B of the 5 Year Plan (ND1)		
Q3	Provide status reports on all activities in NCSP Quarterly Progress Reports (ND3)		
Q3	Provide status reports 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 (ND3)		
Q3	Complete cross-section measurement and evaluation deliverables per the nuclear data schedule in Appendix B of the 5 Year Plan (ND3)		

Q3	Provide status reports on all activities in NCSP Quarterly Progress Reports (ND4)		
Q3	Provide status reports on all activities in NCSP Quarterly Progress Reports (ND6)		
Q3	Provide status reports on all activities in NCSP Quarterly Progress Reports (ND10)		
Q3	Provide status reports on all activities in NCSP Quarterly Progress Reports (ND11)		
Q4	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports (ND1)		
Q4	Provide status reports 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 and evaluation deliverables per the nuclear data schedule in Appendix B of the 5 Year Plan (ND1)		
Q4	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports (ND3)		
Q4	Provide status reports 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 (ND3)		
Q4	Complete cross-section measurement and evaluation deliverables per the nuclear data schedule in Appendix B of the 5 Year Plan (ND3)		
Q4	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports (ND4)		

Q4	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports (ND6)		
Q4	Document SAMMY modernization progress and report status annually to the NCSP Manager (ND6)		
Q4	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports (ND10)		
Q4	Provide status reports on all nuclear data support activities in NCSP Quarterly Progress Reports (ND11)		

ACCOMPLISHMENTS

- **ND1** - Nuclear Data Measurement and Evaluation
  - **Status report on all nuclear data support activities.**
    - Attendance of all ND group members at the annual NCSP TPR with several presentation
    - Attendance of several ND group members at the WANDA2022 meeting
    - Attendance of several ND personnel NDAG meeting
    - Continue to work and mentor new staff and PhD students for data analysis of experimental data.

  - **Complete cross-section measurement and evaluation deliverables per the nuclear data schedule in Appendix B of the 5-year plan.**
    - Travel to JRC-Geel canceled due to COVID-19. Travel will resume in May 2022.
    - **Zr-91** transmission experiments performed at JRC-Geel.
    - Natural Zr capture data reduction continued.
    - V capture and transmission data analysis and evaluation for previously obtained data using various sample thickness has been started. The SAMMY input files have been revisited and adjusted to the new experimental data. V thick sample capture data have been reprocessed for analysis. Transmission data reduction of thin sample is under way.
    - The evaluation of **139-La** and the fitting of resonance parameters continued.
    - **140,142Ce** – ENDF files submitted to NNDC for inclusion in future ENDF release. Technical report of evaluation is in progress.
    - **88Sr** – Resonance parameters from the most recent experiments were translated into SAMMY.par format. Plan is to compare these parameters to existing parameters from ENDF8 and compare both parameter sets against extant experimental data.
    - **Hf** – Search for samples from JEFF evaluation extended. Determined that URR data measured at Karlsruhe in 2006 were not included in ENDF or JEFF evaluations, so efforts will begin on incorporating that data into the ENDF files

- **233U RRR evaluation**: The test on the RRR extended up to 2.5 with fluctuating neutron multiplicities was completed showing improved performance in benchmark calculations. An additional file with updated smoothed neutron multiplicities is under testing. Currently waiting for newly measured capture data from LANL.
- **239Pu RRR evaluation**: extension up to 5 keV is nearly completed. The fitting included ORELA high resolution transmission measurements. Validation test on the latest ENDF file released within the INDEN collaboration was performed showing improved reactivities for thermal solutions. Additional validation tests are in progress at other laboratories.
- The status of the copper evaluation was presented at the NCSP Technical Program Review in February. The INDEN collaborators offered a suggested revision for the **63,65-Cu** elastic scattering angular distributions. Testing this data with copper-sensitive ICSBEP benchmarks via both SCALE and MCNP initially led to conflicting conclusions, which has been investigated further. The plan has been established to keep the INDEN elastic scattering angular distributions, while we focus on finalizing the resolved resonance region. Reintroduced direct-semidirect capture into the copper isotopes evaluation of Cu-63, 65.
- **Hafnium** – Calculated upper limit of possible transmission measurements and determined that new measurements would significantly extend the existing resolved resonance range. Determined that uncertainty of processing of the oxide samples used in the previous experiments warrants new experiments (water in the sample and hence stoichiometry of the sample is questionable). Efforts underway to find samples used for JEFF evaluation & determine their viability for possible transmission measurements.
- **181Ta RRR/URR evaluation**: the RRR/URR file was approved for release and submitted to the ENDF repository
- **Polystyrene** – Classical molecular dynamics simulations set up & run to give preliminary results of thermal scattering. Advanced methods to account for temperature-dependence are being investigated

- **ND3** - Isotopic Sample Leases to Support ND1 ND Measurements
  - Zr-92 sample studies for FY 23 experiments. Only capture sample is needed. Also, recent experiments for Zr92 are evaluated if data needs to be improved by new experiments.

- **ND4** - Thermal Neutron Total Cross Section Measurements for Improvement of Criticality Calculations and Propagation of Scattering Kernel Uncertainties
  - Designed a novel TSL evaluation method for multi-phase materials (e.g. concrete, polyethylene, yttrium hydride, etc.) of interest to NCSP
  - Received a National Energy Research Scientific Computing Center (NERSC) award NP-ERCAP0022357. This is used for TSL calculation on supercomputers. NERSC is a DOE Office of Science User Facility supported by the Office of Science of the U.S. Department of Energy: nersc.gov
  - Worked on a new Machine Learning based methodology to study temperature dependence of phonon spectrum related to materials in ND4 task. Preliminary simulations were compared against polystyrene total cross section measurements from RPI.
  - Preliminary results from generating scattering kernel uncertainties for polystyrene were analyzed. Further analysis, as well as investigating potential other uncertainty quantification techniques, are ongoing.

- **ND6** – SAMMY Nuclear Data Evaluation Code Modernization

- Work continued in consolidating the doppler broadening access in SAMMY. There are four different Doppler broadening algorithms and five resolution broadening options. Previously, each algorithm determined whether broadening should be followed by normalization, summing of isotopes or conversion to transmission. This has been consolidated, eliminating a large amount of duplicate code, and passing of array information. This leads to clearer code flow in the Doppler broadening routines. A C++ parent class for all types of broadening has been created, which handles the energy grid access. Code that allows to set Doppler broadening algorithm at input and then just offers a simple broaden function is almost finished and will be reviewed soon.
- Consolidate the access to the number of isotopes used in a given input to retrieve the value from either the resonance parameters or from the object containing the cross section. These numbers can differ, as the final cross section calculation will be summed over all isotopes. Previously, four different global parameters were used.
- Fix some uninitialized variables and overstepped bounds in parts of the code that were not covered by any test cases. Test coverage was also included.
- Since the container array is no longer used, remove the printout that indicated the amount of storage needed. This will allow the removal of the functions that calculated these values. In addition, all test case results were re-baselined to our new computers infrastructure and compilers, ensuring that they still give the same results within expected precision. The CI was upgraded to use the new compilers.
- For the flag to calculate penetrability, SAMMY wrote out a value for fission that wasn't consistent with the definition in the ENDF manual. This has been rectified.
- Participated in the TPR and gave the SAMMY status report.

- **ND10** - Monte Carlo Evaluation of Differential and Integral Data
  - Report is being finalized.

PUBLICATIONS

Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

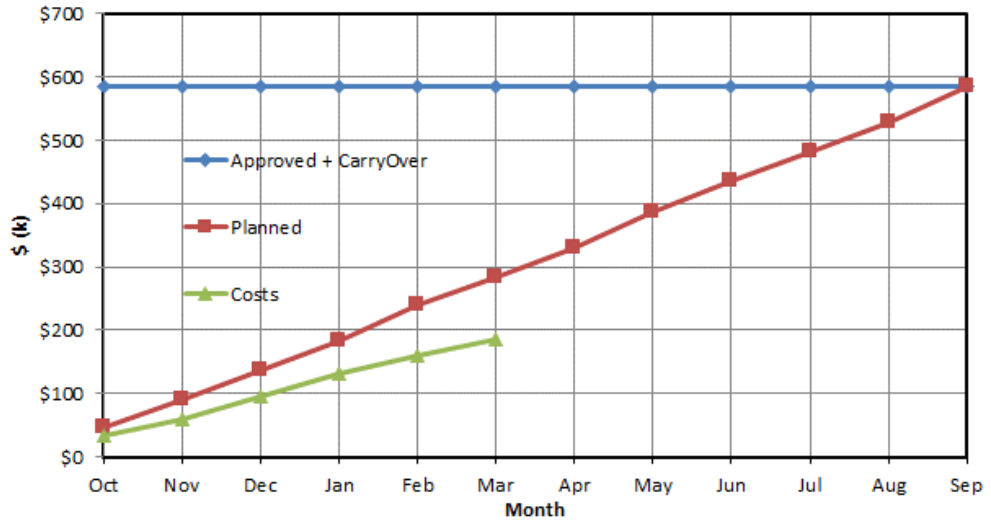
Quarter	Publication Reference Example:	Sent to NCSP? Yes/no	If no, status of submittal
Q1	Received and sent separately	yes	
Q2	Jesse Brown, Goran Arbanas, Andrew Holcomb, Dorothea Wiarda, "Bayesian Monte Carlo Evaluation Framework for Imperfect Nuclear Data," Transactions of the American Nuclear Society, 125,691-694 (December 2021)		
Q2	D.H. Moon, Carlos Paradela, Gery Alaerts, V. Chavan, Klaus Guber, Jan Heyse, S.W. Hong, S. Kopecky, P. Schillebeeckx, R. Wynants, "Results of time-of-flight transmission measurements for 142Ce at a 50 m station of GELINA," INDC International Nuclear Data Committee, March 2021		

Q2	Klaus Guber, Jesse Brown, "ORNL Neutron Cross Section Measurements of 90Zr," Nuclear Data Week, CSEWG Evaluation Session (Virtual), Brookhaven, NY, November 2021		
Q2	Chris Chapman, Andrew Holcomb, Dorothea Wiarda, "Isotope Effects in Thermal Neutron Scattering," Nuclear Data Week, CSEWG Evaluation Session (Virtual), Brookhaven, NY, November 2021		
Q2	Jesse Brown, Goran Arbanas, Dorothea Wiarda, Andrew Holcomb, "Bayesian Monte-Carlo Evaluation Framework for Imperfect Nuclear Data," ANS Winter Meeting (virtual), November 2021		
Q2	Jesse Brown, Goran Arbanas, Andrew Holcomb, Dorothea Wiarda, "Bayesian Monte-Carlo Framework: New Methods for Resonance Parameter Evaluation," NCSP Technical Program Review (virtual), February 2022		
Q2	Jordan McDonnell, "Updates to the n+63,65Cu Angular Distributions for Critical Experiments," NCSP Technical Program Review (virtual), February 2022		
Q2	K. Guber, J. Brown, "ORNL Neutron Cross Section Measurements of 90 Zr NCSP ND-1 Task, " NCSP Technical Program Review (virtual), February 2022		
Q2	Goran Arbanas, Jesse Brown, Chris Chapman, Klaus Guber, Andrew Holcomb, Jordan McDonnell, Marco Pigni, Dorothea Wiarda, Kemal Ramic, "Advances in Nuclear Data Evaluation Theory for NCSP," NCSP Technical Program Review (virtual), February 2022		
Q2	Chris Chapman, Marco Pigni, Klaus Guber, Goran Arbanas, "Resolved Resonance Region Evaluation of n+140,142Ce," NCSP Technical Program Review (virtual), February 2022		
Q2	Chris Chapman, Kemal Ramic, Goran Arbanas, Jesse Brown, Yongqiang Cheng, Yaron Danon, Dominik Fritz, "Thermal Neutron Scattering Research at ORNL – ENDF File Validation," NCSP Technical Program Review (virtual), February 2022		
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: ND1, 3 **M&O Contractor Name**: RPI **Point of Contact Name:** Yaron Danon **Point of Contact Phone:** 518-276-4008	**Reference:** DP0909010 **Date of Report:** April, 14, 2022

BUDGET



1. Carryover into FY 2022 = $114,524 (ND 1,2,3)
2. Approved FY 2022 Budget = $471,000
3. Total FY 2022 Budget w/Carryover = $585,524
4. Actual spending for 1st Quarter FY 2022 = $95,594
5. Actual spending for 2nd Quarter FY 2022 = $91,323
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $200K

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-2022 Q2)

Q1	Provide status report on all LINAC refurbishment activities (ND3)		Provided a report during ANS meeting
Q1	Complete SOL 1 Accelerator Section RF Conditioning. (ND3)		In progress
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 TPV Accelerator Section RF Conditioning. (ND3)		RF windows test still stalled due to vacuum issues.
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	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 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)		

ACCOMPLISHMENTS

- ND1 – Resonance Region Nuclear Data Measurement Capability at RPI
  - Working analysis and reduction of Fe-54 transmission data.
  - Fe-54 Resonance evaluation parameter with SAMMY using RPI capture and transmission datasets
  - Completed a design and preliminary testing of a neutron beam imaging system to aid in future radiative capture measurement
- ND3 – RPI/ORNL: LINAC 2020 Nuclear Data Capabilities Maintenance Plan
  - RF windows testing stalled due to vacuum issues.

PUBLICATIONS

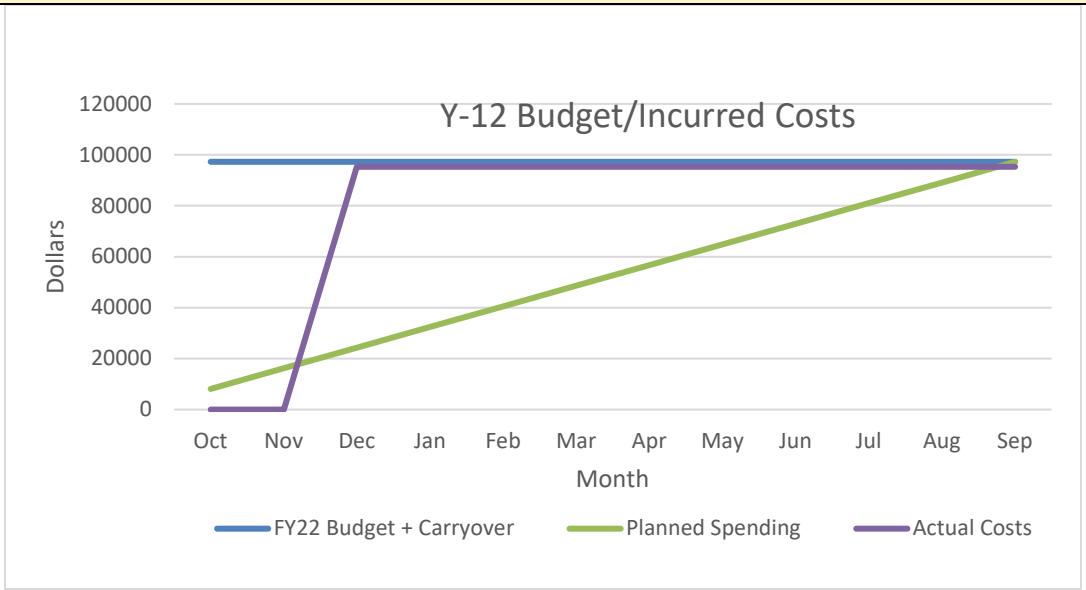
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

Quarter	Publication Reference **Example:** Author, "Title", LA-UR-18-27731, October 1, 2019	Sent to NCSP? Yes/no	If no, status of submittal
Q1	Yaron Danon, Peter Brand, Michael Bretti, Brian Epping, and Timothy Trumbull, “RPI LINAC refurbishment and upgrade project”, Transactions of the American Nuclear Society, Volume 125, 2021	Yes	
Q2			
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: ND1 **M&O Contractor Name**: Y12 **Point of Contact Name:** Kevin Reynolds **Point of Contact Phone:** (865) 241-9067	**Reference:** DP0909020 **Date of Report:** April 14, 2022

BUDGET



1. Carryover into FY 2022 = $ 97,266.06
2. Approved FY 2022 Budget = $0K
3. Total FY 2022 Budget w/Carryover = $97,266.06
4. Actual spending for 1st Quarter FY 2022=$95,316.16 ($95k commit from GELINA work costed)
5. Actual spending for 2nd Quarter FY 2022 = $0.00
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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	As necessary, provide a status report of the fabrication of a depleted uranium/molybdenum target per IRMM/GELINA specifications to the NCSP Manager. (ND1)		GELINA Delivered. Project Complete.
Q2			
Q3			

Q4			

ACCOMPLISHMENTS

- ND1 - Y-12 Fabrication of New Uranium Target for IRMM/GELINA for Cross-section Measurements – delivered; project complete.

PUBLICATIONS

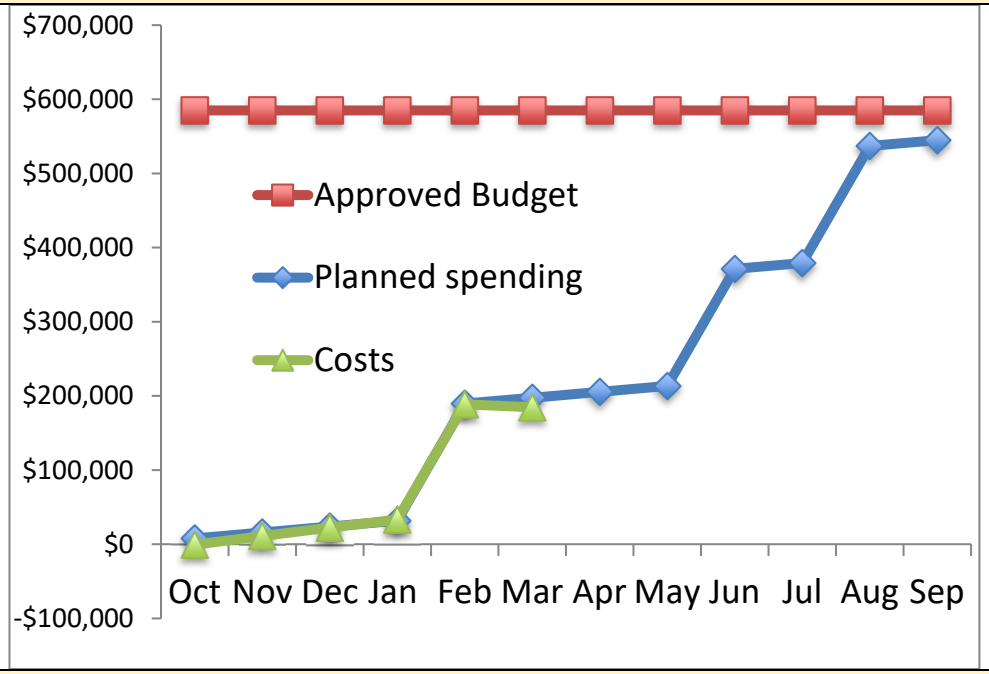
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

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

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: TE3, 6 **M&O Contractor Name**: LANL **Point of Contact Name:** Joetta Goda **Point of Contact Phone:** 505-667-2812	**Reference:** DP0909010 **Date of Report:** April 7, 2022

BUDGET



1. Carryover into FY 2022 = $45,000
2. Approved FY 2022 Budget = $540,000
3. Total FY 2022 Budget w/Carryover = $585,000
4. Actual spending for 1st Quarter FY 2022 = $22,365 +$18,314 committed = $40,679
5. Actual spending for 2nd Quarter FY 2022 = $162,316 + $2,913 committed = $165,229
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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 training activities to the NCSP Manager (TE3)		
Q1	Provide status reports on development of university pipeline for CS professionals (TE6)		
Q2	Provide status reports on all training activities to the NCSP Manager (TE3)		

Q2	Provide status reports on development of university pipeline for CS professionals (TE6)		
Q3	Provide status reports on all training activities to the NCSP Manager (TE3)		
Q3	Provide status reports on development of university pipeline for CS professionals (TE6)		
Q4	Provide status reports on all training activities to the NCSP Manager (TE3)		
Q4	Provide status reports on development of university pipeline for CS professionals (TE6)		

ACCOMPLISHMENTS

- TE3 – Conduct Hands-On Criticality Safety Training Course at NCERC
  - February CSE class
  - Preparations for June CSO/Manager's Class
- TE6 – Development of University Pipeline for Criticality Safety Professionals
  - Presentation at TPR

PUBLICATIONS

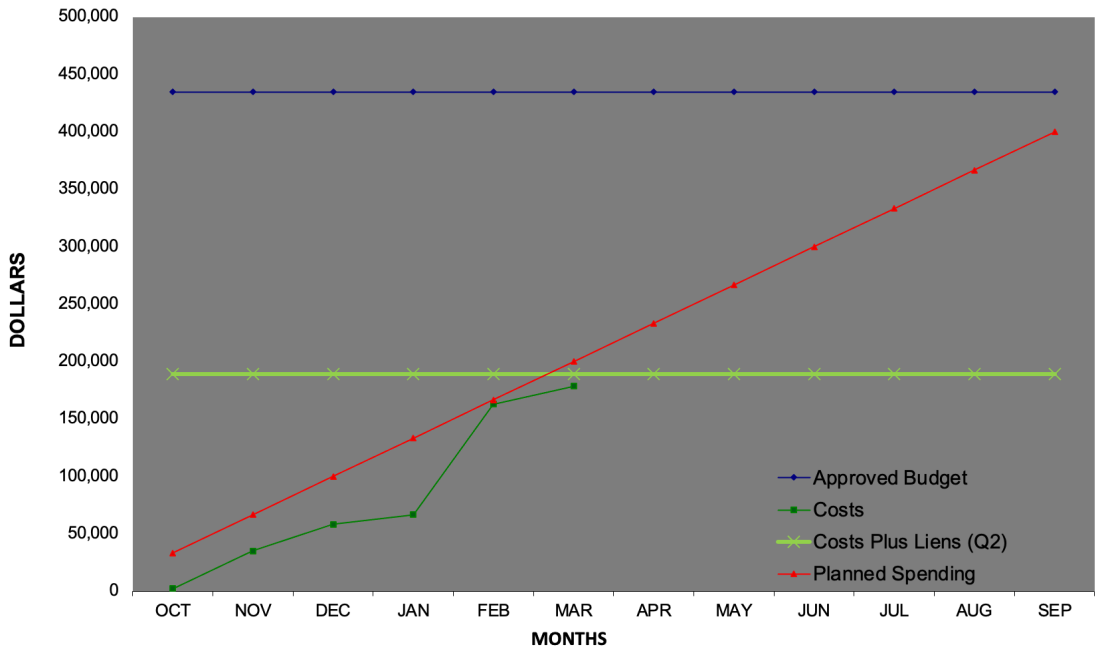
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

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-2022 Q2)

NCSP Element and Subtask: TE1, 3, 8 **M&O Contractor Name**: LLNL **Point of Contact Name:** Catherine Percher **Point of Contact Phone:** (925) 579-4226	**Reference:** DP0909010 **Date of Report:** April 15, 2022

BUDGET



1. Carryover into FY 2022 = $44,699
2. Approved FY 2022 Budget = $390,000
3. Total FY 2022 Budget w/Carryover = $434,699
4. Actual spending for 1st Quarter FY 2022 = $58,417
5. Actual spending for 2nd Quarter FY 2022 = $120,181 ($10,599 liens)
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $ 35,000 (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 status report on hands-on training at the DAF (TE1)		
Q1	Provide status report classroom criticality safety training (TE3)		
Q1	Provide status report on development of university pipeline for CS professionals. (TE8)		

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

ACCOMPLISHMENTS

- TE1 – Conduct Hands-on Training at the DAF (TACS)
  - Participated in all telecons for preparations for the FY22 courses
  - Provided registration and interface with students enrolling in all NCSP courses
  - Provided first day lectures and hands-on training with the TACS assembly for February course
- TE3 – Classroom Criticality Safety Training
  - Participated in all telecons for preparations for the FY22 courses
  - Provided lectures for first week of the February course
- TE8 - Development of University Pipeline for Criticality Safety Professionals
  - Presented overview of UCBerkeley Course at February 2022 TPR

PUBLICATIONS

Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

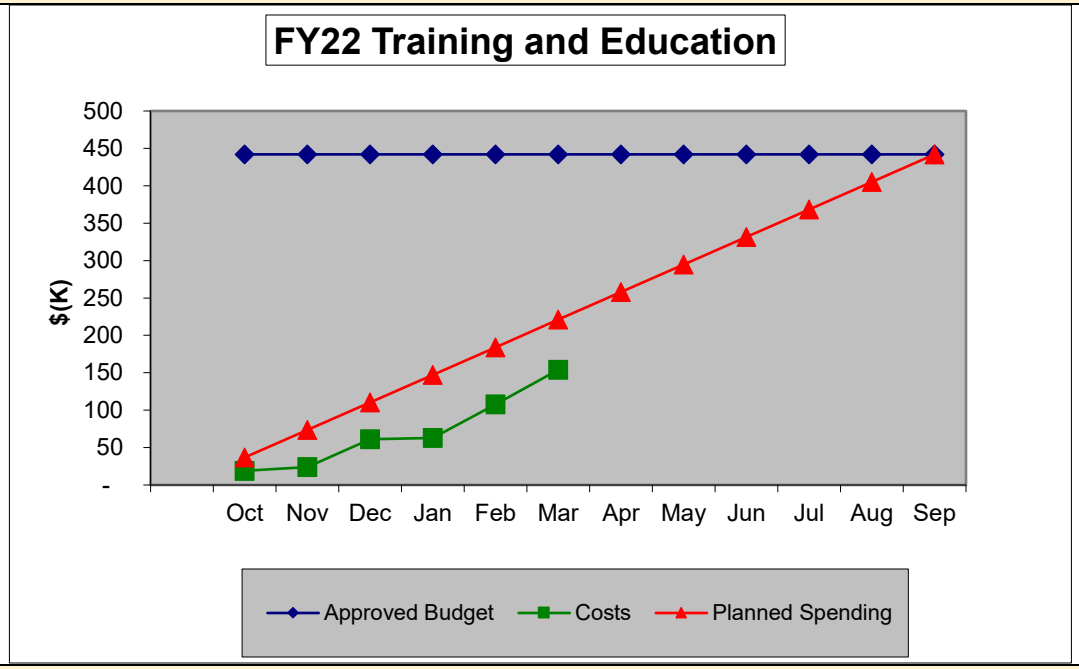
Quarter	Publication Reference **Example:** Author, "Title", LA-UR-18-27731, October 1, 2019	Sent to NCSP? Yes/no	If no, status of submittal

Q1			
Q2	Coleman, S. NCS Pipeline UC Berkeley Course Overview. Presented at the NCSP Technical Program Review. February 16, 2022.	Yes	
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: TE1, 3, 11, 12, 14 **M&O Contractor Name**: ORNL **Point of Contact Name:** Doug Bowen **Point of Contact Phone:** (865) 576-0315	**Reference:** DP0909010 **Date of Report:** April 18, 2022

BUDGET



1. Carryover into FY 2022 = $193K
2. Approved FY 2022 Budget = $249K
3. Total FY 2022 Budget w/Carryover = $442K
4. Actual spending for 1st Quarter FY 2022 = $61K
5. Actual spending for 2nd Quarter FY 2022 = $93K
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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 implementation of the NCS training program (TE1)		
Q1	Provide a status report on hand-calculation primer expansion, LA-14244-M (TE3)		Continue working at current pace until project is complete. Subcontractor used for work is retired and is limited to how much time that can be spent on the project.

NCSP Quarterly Progress Report (FY-2022 Q2)

Q1	Provide a status report on revision of LA-12808 Nuclear Criticality Safety Guide. (TE11)		Limited resources to direct to this task due to attrition. Anticipate completing this by the end of the FY.
Q1	Provide a status report on design of a Subcritical/Critical Assembly at ORNL for Use with the CSO/FMH Courses. (TE12)		Y-12 delays for shipping costs in FY21Q4 and ORNL issues with finalizing the list of ORNL sites to house the assembly, this task is delayed. Anticipate completion of final report by FY22Q3.
Q1	Provide a status report on nuclear criticality safety training and pipeline development (TE 14)		Awaiting sufficient funding from NNSA to set up a subcontract with all parties to begin work. Only CR1 funds have been available to date (01-20-2022).
Q2	Provide a status report on implementation of the NCS training program (TE1)		2-week hands-on course completed on schedule.
Q2	Provide a status report on hand-calculation primer expansion, LA-14244-M (TE3)		Hand calc primer progress is delayed from FY21 due to resource issues; however, the primer will be completed by Q4.
Q2	Provide a status report on revision of LA-12808 Nuclear Criticality Safety Guide. (TE11)		LA-12808 progress is delayed from FY21 due to resource issues; however, the primer will be completed by Q4.
Q2	Provide a status report on design of a Subcritical/Critical Assembly at ORNL for Use with the CSO/FMH Courses. (TE12)		Resource issues and delays from Y-12 in FY21 has delayed this task but it is due to be completed by Q4.
Q2	Provide a status report on nuclear criticality safety training and pipeline development (TE 14)		The delay in obtaining FY22 funding and delays in the ORNL contracts organization have delayed the start of two subcontracts to initiate this work. Contracts in progress.
Q3	Provide a status report on implementation of the NCS training program (TE1)		
Q3	Provide a status report on hand-calculation primer expansion, LA-14244-M (TE3)		
Q3	Provide a status report on revision of LA-12808 Nuclear Criticality Safety Guide. (TE11)		
Q3	Provide a status report on design of a Subcritical/Critical Assembly at ORNL for Use with the CSO/FMH Courses. (TE12)		
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 hand-calculation primer expansion, LA-14244-M (TE3)		

Q4	Provide a status report on revision of LA-12808 Nuclear Criticality Safety Guide. (TE11)		
Q4	Provide a status report on design of a Subcritical/Critical Assembly at ORNL for Use with the CSO/FMH Courses. (TE12)		
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 conducted preparatory telecons for the Jan/Feb 2-week hands-on to begin logistical preparations. Bowen/Hudson/Henley worked on student rosters and ensuring the student load in each course was reasonable. Bowen continued to contact site NCS managers to solicit students for the for courses in FY22. Bowen traveled to SNL in February to begin initial preparations for planning the CSO/Manager course Pilot at Sandia in April 2022. The first 2-week hands-on course was completed successfully at NATM, Sandia, and NCERC over the period Jan. 31-Feb. 4, 2022, with a total of 22 students (8 @ SNL and 14 @ NCERC). A full paper for the status of the NCSP T&E program has been submitted to the NCSD topical in June.
- TE3 - Hand-calculation Primer Expansion, LA-14244-M
  - The primer drafts were complete to begin review campaigns to catch and fix errors in the main document. Lang, Shaw, and Greene at ORNL reviewed the primer drafts and the website complement to fix errors and to recommend improvements. The document is due for final completion by the end of May and will be completed this FY. The website tool to complement the example problems is in the final stages of development by a subcontractor and should be completed by the end of Q3.
- TE11 - Revision of the LA-12808 Nuclear Criticality Safety Guide
  - This task has been delayed by availability of resources, but work is in progress. A draft document is due to be completed in Q3 for review in Q4.
- TE12 - Design of a Subcritical/Critical Assembly at ORNL for Use with the CSO/FMH Courses
  - COVID and Y-12 delays in FY21 pushed this task into FY22. In Q2, final design calculations were updated to include Al cladded fuel to preclude spreading U-contamination during operations. Using TSUNAMI and USLSTATS, the validation work was completed and added to the design document as well. Additional facilities at ORNL are being considered for the operation of the assembly now that ORNL staff are returning to work post-pandemic.
- TE14 - Nuclear Criticality Safety Training and Pipeline Development
  - In Q2, FY22 funding delays from NNSA has delayed subcontract development until Q3. In late Q2, meetings were held between ORNL, GA Tech (Steven Biegalski) and TA&M (Pavel Tsvetkov) to discuss preliminary work on the subcontract and scope for the task. Significant progress should be made in Q3 with additional funding and contract resources put onto this task.

PUBLICATIONS

NCSP Quarterly Progress Report (FY-2022 Q2)

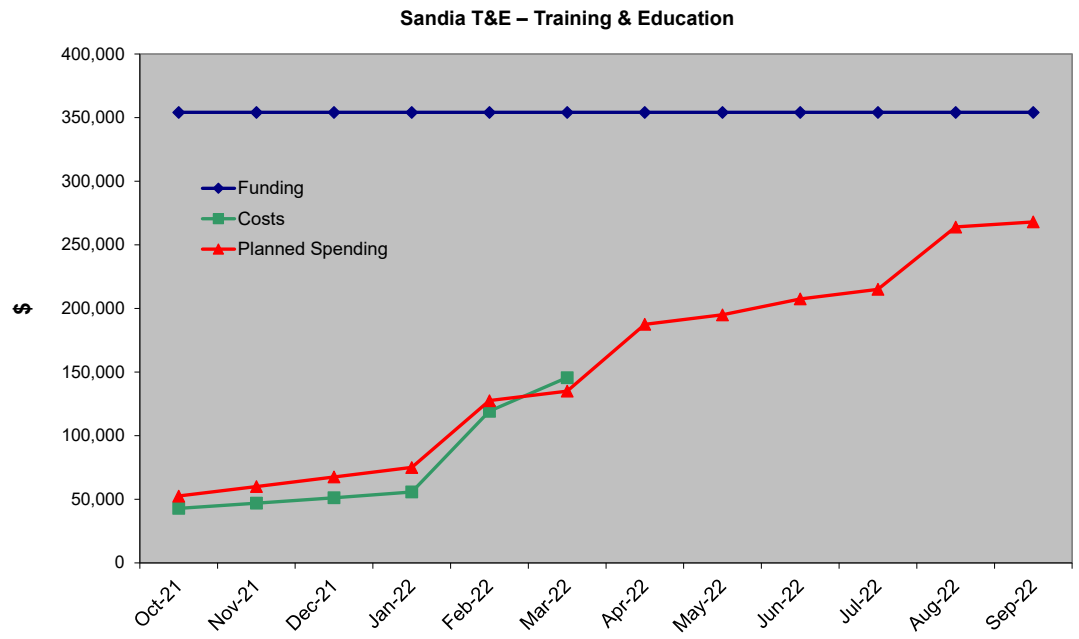
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

Quarter	Publication Reference **Example:** Author, "Title", LA-UR-18-27731, October 1, 2019	Sent to NCSP? Yes/no	If no, status of submittal
Q1	None	No	
Q2	Douglas Bowen, "American Nuclear Society ANS-8 Standards Forum," ANS Winter Meeting (virtual), November 2021	Yes	
Q2	Douglas Bowen, "CURRENT STATUS OF THE DOE/NNSA NUCLEAR CRITICALITY SAFE-TY PROGRAM HANDS-ON CRITICALITY SAFETY TRAINING COURSES," submitted ANS Nuclear Criticality Safety Meeting, June 2022		
Q2	Douglas Bowen, Mathieu Dupont, Alex Lang, Andrew Holcomb, Shane Hart, "A SUBCRITICAL ASSEMBLY FOR TRAINING AND EDUCATION USE AT THE OAK RIDGE NATIONAL LABORATORY," submitted ANS Nuclear Criticality Safety Meeting, June 2022		
Q2	Douglas Bowen, "DOMESTIC AND INTERNATIONAL STANDARDS FOR NUCLEAR CRITICALITY SAFETY – OVERVIEW & STATUS," submitted ANS Nuclear Criticality Safety Meeting, June 2022		
Q2	Douglas Bowen, Robert Busch, "HAND CALCULATIONS FOR NUCLEAR CRITICALITY SAFETY – PRIMER REVISION," submitted ANS Nuclear Criticality Safety Meeting, June 2022		
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

51NCSP Element and Subtask: TE1 **M&O Contractor Name**: Sandia National Laboratories (SNL) **Point of Contact Name:** Gary A. Harms **Point of Contact Phone:** (505)845-3244	**Reference:** DP0909010 **Date of Report:** March, 2022

BUDGET



1. Carryover into FY 2022 = $ 131,150
2. Approved FY 2022 Budget = $223,000
3. Total FY 2022 Budget w/Carryover = $354,150
4. Actual spending for 1st Quarter FY 2022 = $51,170
5. Actual spending for 2nd Quarter FY 2022 = $94,432
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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	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)		

Q2	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)		
Q3	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)		
Q4	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
  - The Sandia portion of a make-up Hands-On criticality safety class for NCS professionals was delivered September 27 – October 1 that costed this FY.
  - Preparations were made for a Hands-On criticality safety class for NCS professionals to be presented in January/February.
  - The HFER module of the classroom portion Hands-On criticality safety class for NCS professionals was delivered January 31 – February 4.
  - The Sandia experimental portion of a Hands-On criticality safety class for NCS professionals was delivered February 7 – 11.
  - The modules for the Sandia Managers Hands-On criticality safety class were adjusted to include new material for CSOs.
  - Individual modules were submitted to Sandia's R&A system and now have associated SAND #s.
  - The Hands-On criticality safety class for Managers and CSOs was delivered April 4 – 8.

PUBLICATIONS

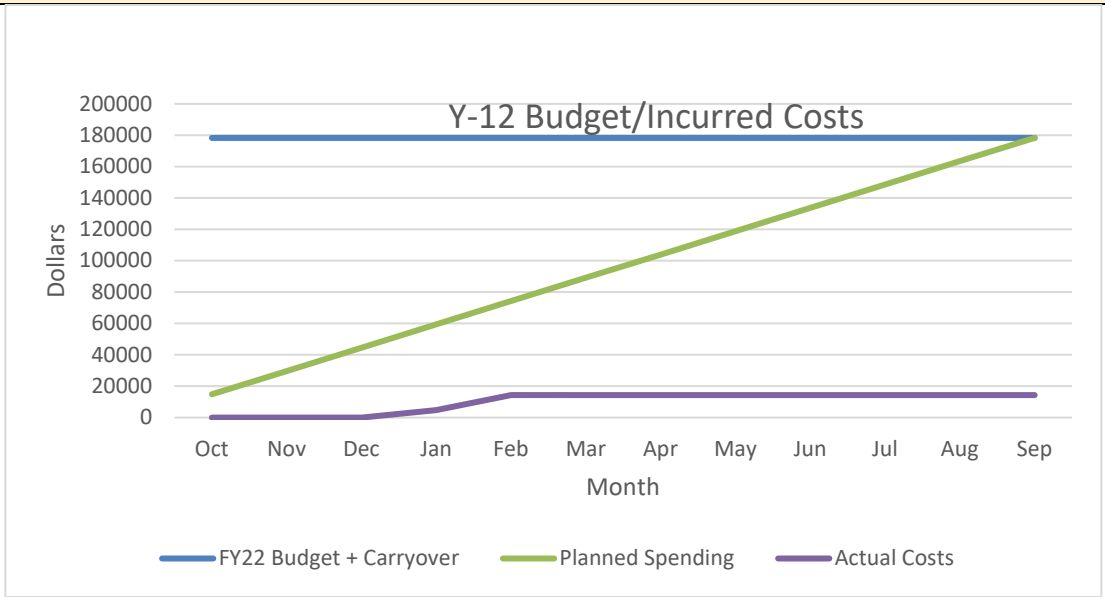
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

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-2022 Q2)

NCSP Element and Subtask: TE1 **M&O Contractor Name**: Y12 **Point of Contact Name:** Kevin Reynolds **Point of Contact Phone:** (865) 241-9067	**Reference:** DP0909020 **Date of Report:** April 14, 2022

BUDGET



1. Carryover into FY 2022 = $178,302.73
2. Approved FY 2022 Budget = $ 0.00
3. Total FY 2022 Budget w/Carryover = $178,302.73
4. Actual spending for 1st Quarter FY 2022 = $0.00
5. Actual spending for 2nd Quarter FY 2022 = $14,338.88
6. Actual spending for 3rd Quarter FY 2022= $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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	Conduct hands-on training classes at NFO and NCERC to support the training classes in accordance with the approved schedule. (TE1)		No travel.
Q2	Conduct hands-on training classes at NFO and NCERC to support the training classes in accordance with the approved schedule. (TE1)		No travel.

Q3	Conduct hands-on training classes at NFO and NCERC to support the training classes in accordance with the approved schedule. (TE1)		No Travel
Q4	Conduct hands-on training classes at NFO and NCERC to support the training classes in accordance with the approved schedule. (TE1)		No travel

ACCOMPLISHMENTS

PUBLICATIONS

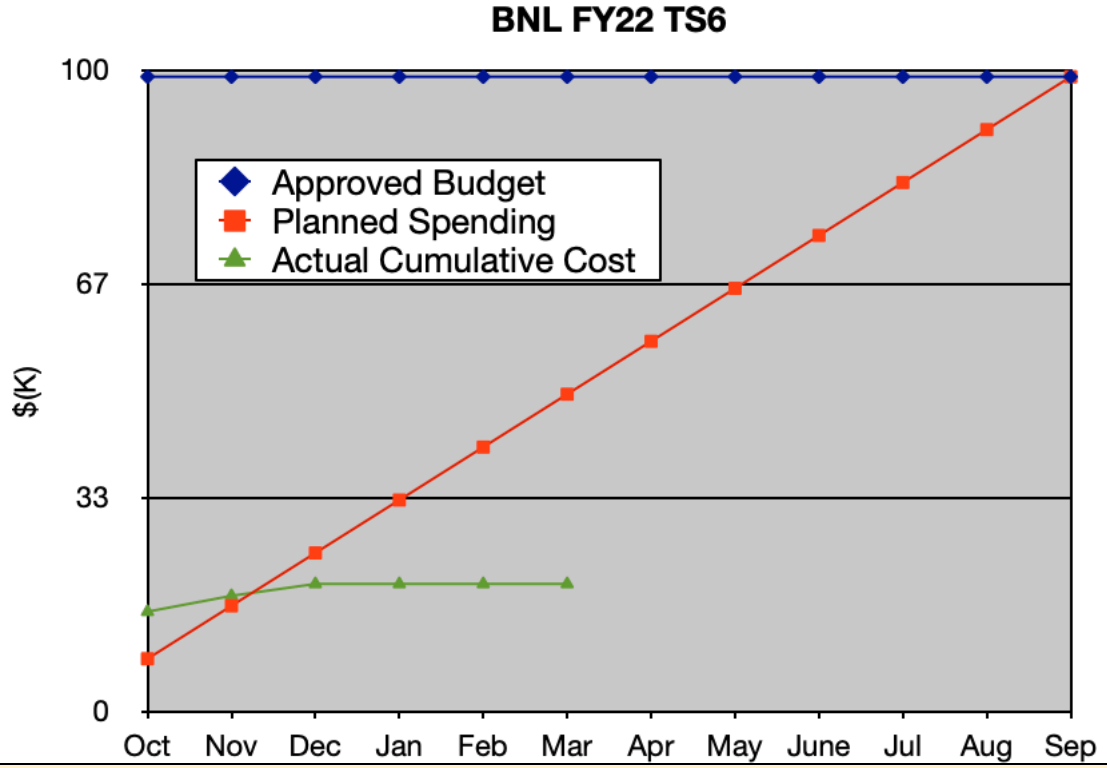
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

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

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: TS6 **M&O Contractor Name**: BNL **Point of Contact Name:** David Brown **Point of Contact Phone:** 631-344-2814	**Reference:** DP0909010 **Date of Report**: 7 April, 2022

BUDGET



1. Carryover into FY 2022 = $ 5,915
2. Approved FY 2022 Budget = $99,000
3. Total FY 2022 Budget w/Carryover = $104,915
4. Actual spending for 1st Quarter FY 2022 = $19,925
5. Actual spending for 2nd Quarter FY 2022 = $0
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

NOTE: Include commitments as part of spending

MILESTONES

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

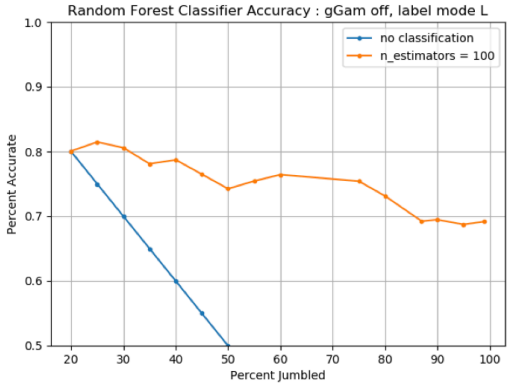
Complete	On Schedule	Behind Schedule	Missed Milestone

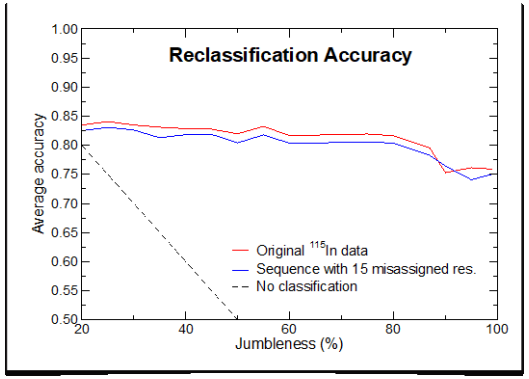
QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide NCSP Manager annual report of succession planning efforts. (TS6)		K. Mbacke (NPT student) will continue to develop codes to extract resonance parameter averages from the *Atlas of Neutron Resonances* through Spring 2022.

			Work on the resonance quantum number reclassification project will resume in earnest in summer with SULI students. In the meantime, BNL will submit first group of resonance quantum number classification papers (we hope!) in Q2.
Q2	Provide NCSP Manager annual report of succession planning efforts. (TS6)		Funds are being reserved to support student Sergey Scoville who is scheduled to collaborate on this project during the upcoming Summer internship
Q3	Provide NCSP Manager annual report of succession planning efforts. (TS6)		
Q4	Provide NCSP Manager annual report of succession planning efforts. (TS6)		

ACCOMPLISHMENTS

- TS6 – ND Succession Planning
  - As illustrated in the plots below, continued investigation in the validation efforts of the Bayesian Resonance Reclassifier allowed us to identify a potentially strong correlation between the training (left plot) and validation (right plot) accuracies. This will be explored in further during the 2022 undergrad Summer internship.
  - .





PUBLICATIONS

Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

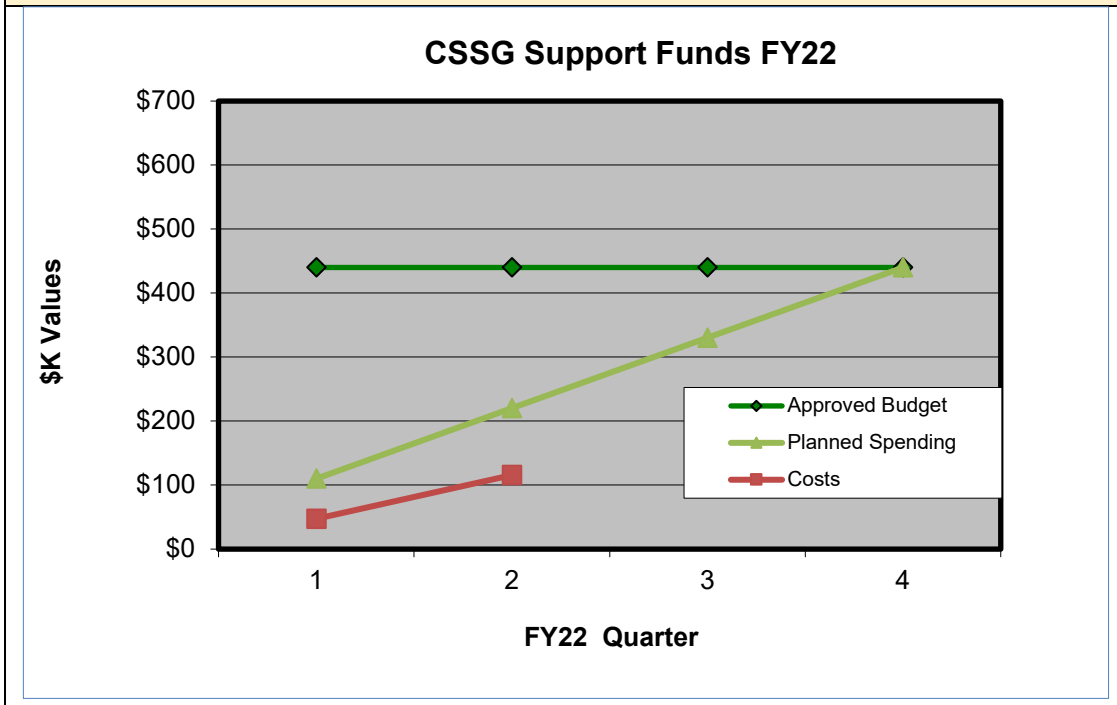
Quarter	Publication Reference **Example:** Author, "Title", LA-UR-18-27731, October 1, 2019	Sent to NCSP? Yes/no	If no, status of submittal

Q1			
Q2			
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

`NCSP Element and Subtask: TS1 **Task Title**: CSSG Support **Point of Contact Name:** David Hayes **Point of Contact Phone:** 505-667-4523	**Reference:** DP0909010 **Date of Report:** April 18, 2022

BUDGET



1. Carryover into FY 2022 = $ 0
2. Approved FY 2022 Budget = $ 440,000
3. Actual spending for 1st Quarter FY 2022 = $47,376
4. Actual spending for 2nd Quarter FY 2022 = $68,250
5. Actual spending for 3rd Quarter FY 2022 = $
6. Actual spending for 4th Quarter FY 2022 = $
7. Projected carryover into FY 2023 = $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 NCSP Manager report of activities. (TS1)		No issues.
Q2	Provide NCSP Manager report of activities. (TS1)		No Issues.
Q3	Provide NCSP Manager report of activities. (TS1)		
Q4	Provide NCSP Manager report of activities. (TS1)		

ACCOMPLISHMENTS

- TS1 – Activities
  - CSSG Telecons
  - CSSG Tasking 2022-01

PUBLICATIONS

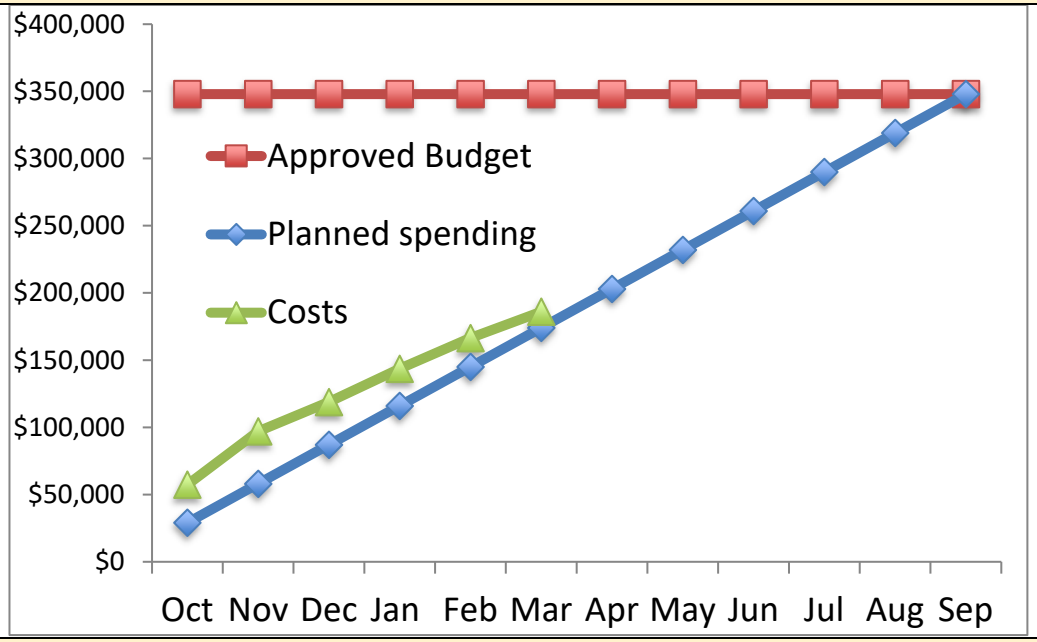
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

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-2022 Q2)

NCSP Element and Subtask: TS4 **M&O Contractor Name**: LANL **Point of Contact Name:** Joetta Goda **Point of Contact Phone:** 505-667-2812	**Reference:** DP0909010 **Date of Report:** April 7, 2022

BUDGET



1. Carryover into FY 2022 = $ 200,000
2. Approved FY 2022 Budget = $148,000
3. Total Budget w/Carryover = $348,000
4. Actual spending for 1st Quarter FY 2022 = $118,813 (no commitments)
5. Actual spending for 2nd Quarter FY 2022 = $ $67,233 (no commitments)
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $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 NCSP Manager report on succession planning efforts. (TS4)		
Q2	Provide NCSP Manager report on succession planning efforts. (TS4)		
Q3	Provide NCSP Manager report on succession planning efforts. (TS4)		

Q4	Provide NCSP Manager report on succession planning efforts. (TS4)		

ACCOMPLISHMENTS

- TS4 – AM, IE, ND Succession Planning
  - Students mentored in ICSBEP evaluations
  - Succession planning for AM/ND

PUBLICATIONS

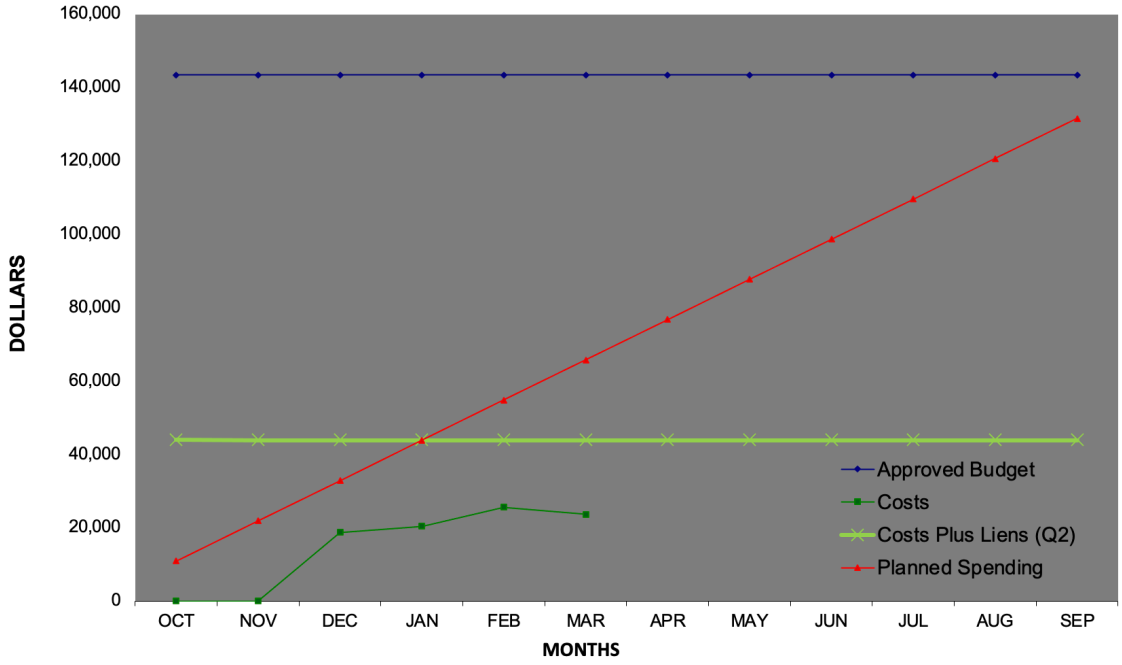
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

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-2022 Q2)

NCSP Element and Subtask: TS5 **M&O Contractor Name**: LLNL **Point of Contact Name:** Catherine Percher **Point of Contact Phone:** (925) 579-4226	**Reference:** DP0909010 **Date of Report:** April 15, 2022

BUDGET



1. Carryover into FY 2022 = $24,797
2. Approved FY 2022 Budget = $149,000
3. Total FY 2022 budget w/Carryover = $173,797
4. Actual spending for 1st Quarter FY 2022 = $18,751
5. Actual spending for 2nd Quarter FY 2022 =$4,966 ($20,354 liens)
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $11,920 (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 NCSP manager report on succession planning efforts. (TS5)		Hired new PostDoc starting Jan 2022, mainly to support IE projects
Q2	Provide NCSP manager report on succession planning efforts. (TS5)		New PostDoc started January 2022, hired second PostDoc to start in June 2022, both will mainly support IE projects
Q3	Provide NCSP manager report on succession planning efforts. (TS5)		

Q4	Provide NCSP manager report on succession planning efforts. (TS5)		

ACCOMPLISHMENTS

- TS5 - AM, IE, ND Succession Planning
  - J. Norris participated in IE telecons
  - New Postdoc (E. Aboud) started in January of 2022, mainly assisting on IE projects
  - Hired new Postdoc (A. Tamashiro) to start in June of 2022, mainly to assist on IE and interface with dosimetry

PUBLICATIONS

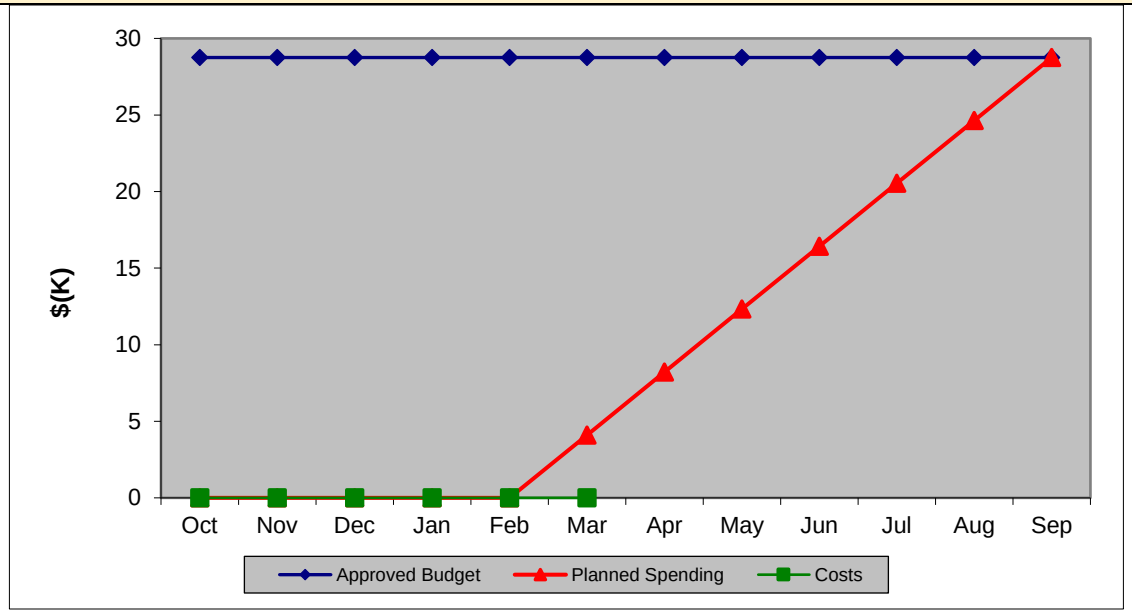
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

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-2022 Q2)

NCSP Element and Subtask: TS9 **M&O Contractor Name**: NNL **Point of Contact Name:** Mike Zerkle **Point of Contact Phone:** (412) 476-6188	**Reference:** DP0909010 **Date of Report:** April 15, 2022

BUDGET



1. Carryover into FY 2022 = $29k
2. Approved FY 2022 Budget = $0k
3. Total FY 2022 Budget with Carryover = $29k
4. Actual spending for 1st Quarter FY 2022 = $0k
5. Actual spending for 2nd Quarter FY 2022 = $0K
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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 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)		

ACCOMPLISHMENTS

- TS9 – Support for NDAG Chair activities
  - Participated in 2022 NCSP Technical Program Review
  - Chaired Feb 2022 NDAG meeting
  - Participated in WANDA-2022 meeting
  - Participated in several SINBAD Task Force meetings
  - Performed visual inspection of finished Hf test plates for IER-532 (TEX HEU-Hf) at the vendor site, authorized on shipment of finished Hf test plates. Hf test plates shipped on schedule and LANL has confirmed receipt at the NCERC warehouse.
  - Supported several CEdTs

PUBLICATIONS

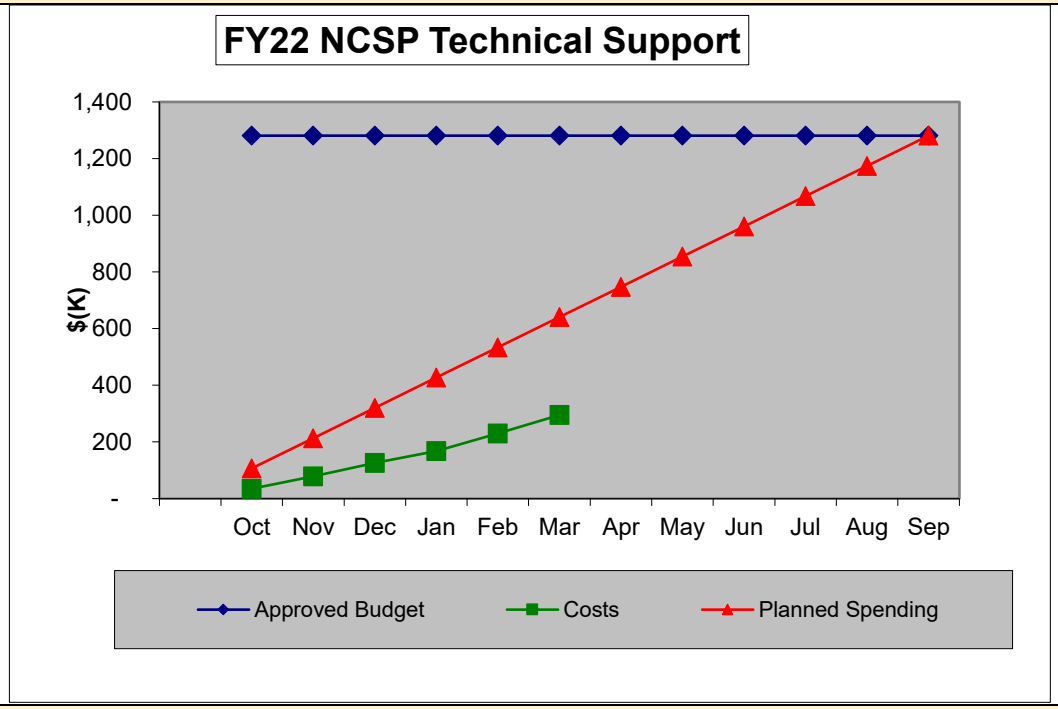
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

Quarter	Publication Reference **Example:** Author, "Title", LA-UR-18-27731, October 1, 2019	Sent to NCSP? Yes/no	If no, status of submittal
Q1	J. L. Wormald, J. C. Holmes, M. L. Zerkle, “Comparative Critical Mass Calculations for NNL and ENDF/B-VIII.0 Zirconium Hydride Thermal Neutron Scattering Laws,” PHYSOR-2022 (accepted). J. L. Wormald, J. C. Holmes, M. L. Zerkle, “Thermal Neutron Scattering Law Evaluation for Zirconium Carbide and Critical Mass Calculations,” PHYSOR-2022 (accepted).	No No	Submit after publication, copyrighted Submit after publication, copyrighted
Q2	M. L. Zerkle, J. L. Wormald, and J. C. Holmes, “Thermal Neutron Scattering Law for Beryllium Hydride and Critical Mass Calculations,” NCSD2022 (accepted)	No	Submit after publication, copyrighted
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: TS2, 7, 8, 13 **M&O Contractor Name**: ORNL **Point of Contact Name:** Doug Bowen **Point of Contact Phone:** (865) 576-0315	**Reference:** DP0909010 **Date of Report:** April 18, 2022

BUDGET



1. Carryover into FY 2022 = $ 0
2. Approved FY 2022 Budget = $1,203K
3. Total FY 2022 Budget w/Carryover = $1,203K
4. Actual spending for 1st Quarter FY 2022 = $126K
5. Actual spending for 2nd Quarter FY 2022 = $
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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	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)		

NCSP Quarterly Progress Report (FY-2022 Q2)

Q1	Manage 5-year plan development and maintenance and oversee the CEDT process and manage main 5-year plan and Integral Experiment Request Milestones. (TS2)		
Q1	Provide NCSP Manager annual report of succession planning efforts (TS7)		
Q1	Provide NCSP Manager a status report of progress on the new IER system in G2 (TS8)		
Q1	Provide the NCSP manager an update of NDA Technical Support Group and NDA Technical Infrastructure Project activities. (TS13)		Lack of engagement of Federal Project Manager of the NDA program. No work performed in Q1. Mission and vision completed in FY21Q2: https://nda.llnl.gov/docs/ORNL_TM-2021_2009_NDA_Mission_and_Vision-FINAL.pdf
Q2	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)		
Q2	Manage 5-year plan development and maintenance and oversee the CEDT process and manage main 5-year plan and Integral Experiment Request Milestones. (TS2)		
Q2	Provide NCSP Manager annual report of succession planning efforts (TS7)		
Q2	Provide NCSP Manager a status report of progress on the new IER system in G2 (TS8)		
Q2	Provide the NCSP manager an update of NDA Technical Support Group and NDA Technical Infrastructure Project activities. (TS13)		Lack of engagement of Federal Project Manager of the NDA program. No work performed in Q1. Mission and vision completed in FY21Q2: https://nda.llnl.gov/docs/ORNL_TM-2021_2009_NDA_Mission_and_Vision-FINAL.pdf
Q3	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)		
Q3	Manage 5-year plan development and maintenance and oversee the CEDT process and manage main 5-		

	year plan and Integral Experiment Request Milestones. (TS2)		
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
  - Prepare and maintain elements of NCSP Plan and associated activities:
    - Monitor Five-Year Plan progress,
    - Review/revise task list,
    - Schedule/participate in meetings and teleconferences.
    - Manage and provide oversight/coordinate efforts for the NCSP Information, Preservation, and Dissemination task element.

        - Manage and provide oversight/coordinate efforts for the NCSP Training and Education Program task element.
    - Participated in NCSP management team and other NCSP-related meetings, as required by the NCSP Manager.
    - Prepared Q1 QPRs into a single bookmarked PDF file for use in QPR. Conducted Q1 telecon with NCSP task managers.
    - Henley completed work on the FY22 Spring Newsletter working with site task managers
    - Participated in CSSG telecons and assisted with CSSG tasks as necessary.
    - Led and participated telecons and WebEx/Teams meetings as necessary to track NCSP MGT team actions and deliverables.
    - Bowen worked with John Miller to oversee IE work for the IE Section of the 5-year plan
    - Working on NCSP website enhancements and fixes and updates for accomplishments, foreign travel reports, and planning calendars.
    - Proposal call delayed until FY23 – pre-planning in progress including adding proposal details to the NCSP website.
- TS7 - AM, ND Succession Planning
    - Succession planning funds used for new hires at ORNL in AM, ND, and TE.
- TS8 - NCSP Program Management Tools Development
    - Bowen/Miller worked with Brady Wenrich and John Risler at NNSA HQ to prioritize IER database updates for FY22. Funding being managed at HQ and funds will be transferred from ORNL to HQ to fund G2 subcontractors to work these priorities. Some signature bugs were discovered in Q1 that require investigation and fixes by the G2 team in the short term.
- TS13 - NDA Technical Support Group and NDA Technical Infrastructure Project
    - D. Bowen supported the revision of the ANSI/ANS-8.28 standard for NDA administrative requirements in NCS programs – currently in NCSCC review phase. Bowen has reviewed NDA workshop reports and is developing a plan for discussion with the NCSP manager in Q3.

PUBLICATIONS

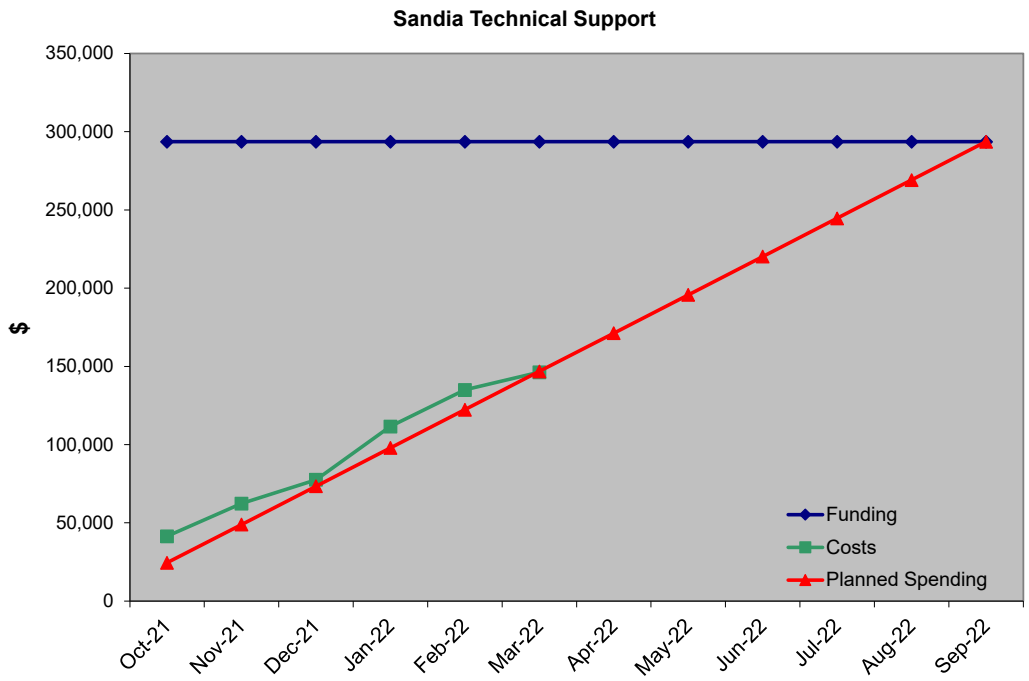
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

Quarter	Publication Reference **Example:** Author, "Title", LA-UR-18-27731, October 1, 2019	Sent to NCSP? Yes/no	If no, status of submittal
Q1	None	Yes	
Q2	Douglas Bowen, "American Nuclear Society Standards Committee Subcommittee 8 Meeting," ANS Winter Meeting (virutal), November 2021	Yes	
Q2	Douglas Bowen, "Brief Overview of the NCSP," ANS Winter Meeting (Virtual), November 2021	Yes	
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q2)

NCSP Element and Subtask: TS3, 12 **M&O Contractor Name**: Sandia National Laboratories (SNL) **Point of Contact Name:** Gary A. Harms **Point of Contact Phone:** (505)845-3244	**Reference:** DP0909010 **Date of Report:** March, 2022

BUDGET



1. Carryover into FY 2022 = $ 45,602
2. Approved FY 2022 Budget = $ 248,000
3. Total FY 2022 Budget w/Carryover = $293,602
4. Actual spending for 1st Quarter FY 2022 = $77,535
5. Actual spending for 2nd Quarter FY 2022 = $68,646
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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 NCSP Manager with report of succession planning efforts. (TS3)		
Q1	Provide the NCSP manager with a summary of NCSP CEdT support (TS12)		

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_EdT Manager Support

Performed duties as the C_EdT (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 MHLs, for example:
  - Processed BCR submissions (~14).
  - Working with LANL and LLNL to ensure progress on IER 547 procurement items.
  - Tracking progress/updates on Hf items (NNL)- delivery to MSTS in progress
  - MHL items 305, 423, 499 all BCRd one quarter.
  - MHL items 518, 532, 538 and 547 progressing and should be met.
  - Approved or requested approval =IER 557 CED-2, 501 CED-2 and 3A, 520 CED-2, 538 CED-3A
  - IER 488 was split with addition of 567 and 568.
  - 4 Non-NCSP IERs added (#566, 569, 570, and 571).
  - Updated several team memberships per site leads direction
- Assisted IER team members with requested items, and participated in several different IER team meetings:
- Reviewed documents submitted for approval and worked to gain approval by NCSP Manager and capture in G2.
- Interacted with NCSP Management Team, provided technical advice, and assisted on a broad scope of items.
- Facilitated IE meetings with all sites: issuing meeting agenda and minutes.
  - Reported projected final milestone completions and IERs moved out to future FYs.

- Worked in the IER database, assisted others with issues using database, work with G2 developers on database improvement items and issue resolution (sign off signature not recording in system)
- Minor Progress on NCSP IE Manual Revision (MHL item).

PUBLICATIONS

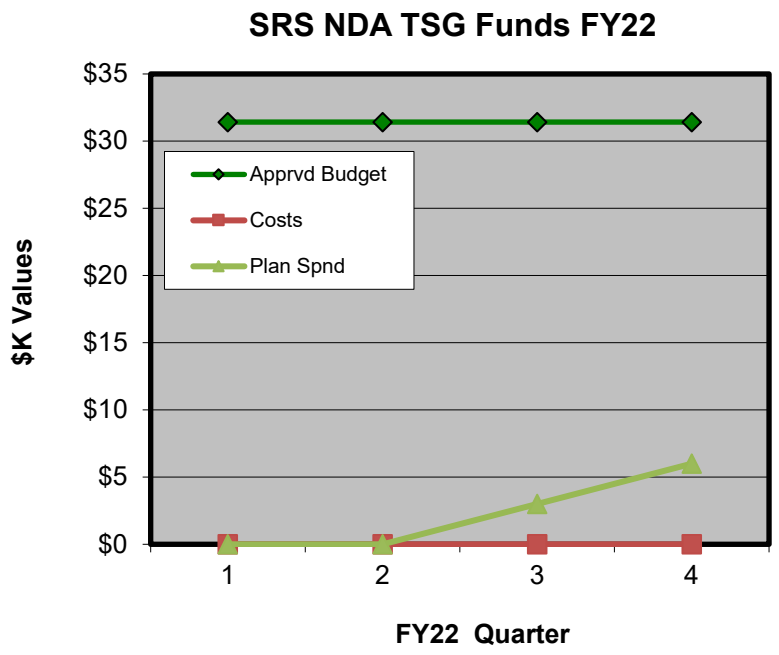
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

Quarter	Publication Reference **Example:** Author, "Title", LA-UR-18-27731, October 1, 2019	Sent to NCSP? Yes/no	If no, status of submittal
Q1	E. C. Lutz and D. E. Ames, “Space Nuclear Thermal Propulsion Critical Assembly Boron Worth Experiments,” SAND2021-8245 C, presented at the 2021 ANS Winter Meeting, Nov. 30 – Dec. 3, 2021.	Yes	
Q2			
Q3			
Q4			

NCSP Quarterly Progress Report (FY-2022 Q1)

NCSP Element and Subtask: TS15 **M&O Contractor Name**: SRNS **Point of Contact Name:** David Erickson **Point of Contact Phone:** 803-557-9445	**Reference:** DP0909010 **Date of Report:** April, 2022

BUDGET



1. Carryover into FY 2022 = $31,400
2. Approved FY 2022 Budget = $0
3. Total FY 2022 Budget w/Carryover = $31,400
4. Actual spending for 1st Quarter FY 2022 = $0
5. Actual spending for 2nd Quarter FY 2022 = $0
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $TBD

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 an update of NDA Technical Support Group and NDA Technical Infrastructure Project activities. (TS15)		No activity associated with this task.
Q2	Provide an update of NDA Technical Support Group and NDA Technical Infrastructure Project activities. (TS15)		No activity associated with this task.

Q3	Provide an update of NDA Technical Support Group and NDA Technical Infrastructure Project activities. (TS15)		
Q4	Provide an update of NDA Technical Support Group and NDA Technical Infrastructure Project activities. (TS15)		

ACCOMPLISHMENTS

- TS15 - NDA Technical Support Group and NDA Technical Infrastructure Project
  -

PUBLICATIONS

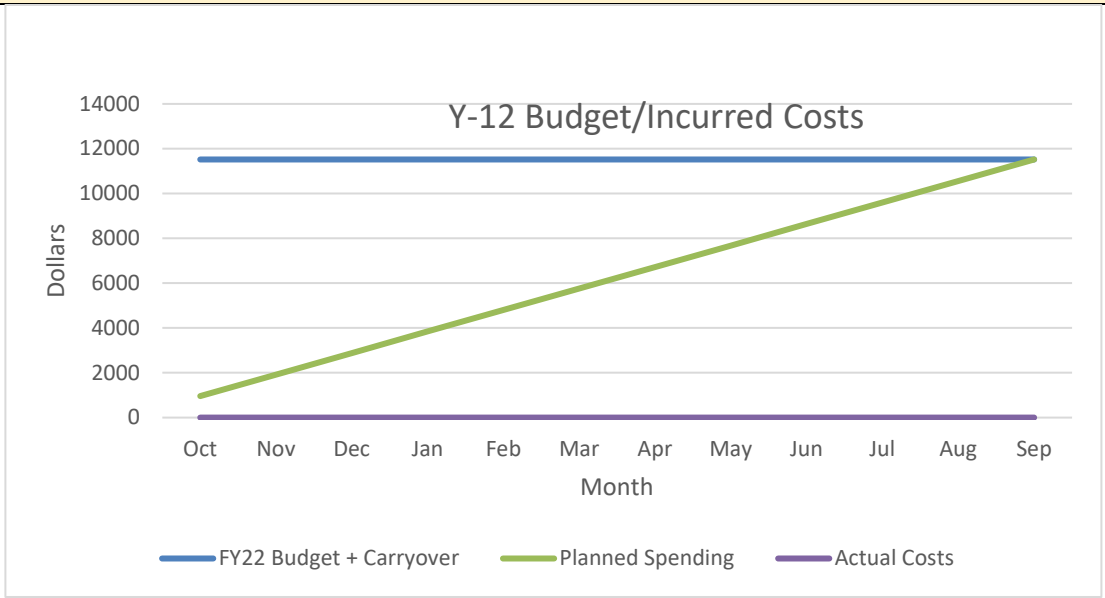
Any publications created during the quarter should be submitted to Marsha Henley, henleym@ornl.gov.

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-2022 Q2)

NCSP Element and Subtask: Technical Support & CSSG (TS) **M&O Contractor Name**: Y12 **Point of Contact Name:** Kevin Reynolds **Point of Contact Phone:** (865) 241-9067	**Reference:** DP0909020 **Date of Report:** April 14, 2022

BUDGET



1. Carryover into FY 2022 = $ 11,519.47
2. Approved FY 2022 Budget = $0
3. Total FY 2022 Budget w/Carryover = $11,519.47
4. Actual spending for 1st Quarter FY 2022 = $ 0.00
5. Actual spending for 2nd Quarter FY 2022 = $0.00
6. Actual spending for 3rd Quarter FY 2022 = $
7. Actual spending for 4th Quarter FY 2022 = $
8. Projected carryover into FY 2023 = $

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 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)		

ACCOMPLISHMENTS

- Attended several virtual CSSG Meetings as new member to the team working on tasking 2022-01
- No travel.

PUBLICATIONS

Any publications created during the quarter should be submitted to Marsha Henley, 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 2022 – Q2

M.E. Rising[1], J.L. Alwin[2]
[1] Monte Carlo Codes (XCP-3), [2] Radiation Transport Applications (XCP-7), LANL

FY2022 – Q2 classes are highlighted in red.

Total Students

- **FY2022 – Q1 118 students (Intro, Intermediate, VR, UM)**
- **FY2022 – Q2: 63 students (Intermediate, Advanced, Safeguards)**
- **FY2022 – Q3: -- students (Intro, Intermediate, Criticality)**
- **FY2022 – Q4: -- students (Intro, NJOY)**
- **FY2022 – TOTAL: 181 students**

Due to COVID-19 and travel restrictions, in-person classes and site visits were canceled. All classes are currently being conducted online. Importantly, offering online classes has significantly increased class enrollment.

Classes sponsored by DOE-NNSA-NCSP

- **Criticality Calculations with MCNP6 (LANL-AM1)**
  - **June 20-23, 2022 online TBD 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.
- **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)
  - **Nov 15 – 19, 2021 online 36 students**
  - **Jun 6 – 10, 2022 online TBD students**
  - **Aug 22 – 26, 2022 TBD TBD students**
- **Intermediate MCNP6**
  - **Oct 4 – 8, 2021 online 39 students**
  - **Jan 31 – Feb 4, 2022 online, OECD-NEA 28 students**
  - **Apr 11–15, 2022 online TBD students**
- **Advanced MCNP6 Features & Utilities**
  - **Feb 7 – 11, 2022 online, OECD-NEA 27 students**
- **Unstructured Mesh with Attila4MC**
  - **Oct 18 – 22, 2021 online 20 students**
- **Variance Reduction**
  - **Nov 29 – Dec 1, 2021 online 23 students**
- **Nuclear Safeguards**
  - **Mar 21 – Mar 25, 2022 in-person, pilot 8 students**
  - **May 23 – May 27, 2022 online TBD students**
- **NJOY**
  - **Aug 29 – 31, 2022 TBD TBD students**

2022 Q2 – SCALE Training Courses Report for the Nuclear Criticality Safety Program

Class Name	SCALE Sensitivity and Uncertainty Analysis for Criticality Safety Assessment and Validation
Class Dates	February 7–10, 2022
Location	Nuclear Regulatory Commission, Rockville, Maryland (Virtual)
Number of Attendees	4
Short Description	Sensitivity and uncertainty analysis methods provide advanced techniques for code and data validation including the identification of appropriate experiments, detailed quantification of bias and bias uncertainty, identification of gaps in available experiments, and the design of new experiments. This four-day training class provided a foundation on sensitivity and uncertainty analysis and applied these methods to criticality safety validation applications. Topics covered include: The TSUNAMI sensitivity and uncertainty analysis techniques for determining the sensitivity of the k-eff eigenvalue to cross section uncertainties using both multigroup and continuous-energy physics. SCALE's comprehensive cross section covariance data library, which is applied to these sensitivity coefficients to estimate the data-induced uncertainty in k-eff. The TSUNAMI-IP code, which determines the correlation between benchmark and application systems in terms of their shared sources of data-induced uncertainty. The USLSTATS trending analysis tool, which uses similarity coefficients from The TSURFER data adjustment tool, with an emphasis on difficulties for safety-basis implementation. Publicly available sources of sensitivity data and how they might be used effectively by NRC applicants. An overview of the Whisper methodology as described by LANL in various publications.

Class Name	SCALE/ORIGEN Standalone Fuel Depletion, Activation, and Source Term Analysis Course
Class Dates	Feb 14 – 17, 2022
Location	Virtual - Oak Ridge National Lab, Oak Ridge, TN
Number of Attendees	20
Short Description	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. No prior knowledge of SCALE is required.

Class Name	Polaris/PARCS for LWR Core Analysis
Class Dates	Feb 21 – 25, 2022
Location	Virtual - Oak Ridge National Lab, Oak Ridge, TN
Number of Attendees	17
Short Description	This training course focuses on using the SCALE/Polaris lattice physics code for generating nuclear data for the PARCS nodal core simulator. Application of the Polaris-generated data for typical core analyses with PARCS will be demonstrated for PWR conventional cores. Participants will learn how to model different lattice types with Polaris, how to process Polaris-generated nuclear data using GenPMAXS, and how to apply these data in PARCS to model LWR cores and perform typical core analyses such as reactivity balance, power distributions, control rod worth, reactivity coefficients and related parameters, throughout a cycle of operation. Previous experience with SCALE is recommended.

Class Name	SCALE Criticality Safety Calculations
Class Dates	Feb 28 – Mar 3, 2022
Location	Virtual - Oak Ridge National Lab, Oak Ridge, TN
Number of Attendees	9
Short Description	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. No prior knowledge of SCALE is required.

Class Name	SCALE Criticality and Radiation Shielding
Class Dates	Mar 7 – 10, 2022
Location	Virtual - Oak Ridge National Lab, Oak Ridge, TN
Number of Attendees	15
Short Description	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. No prior knowledge of SCALE is required.

Class Name	SCALE Sensitivity and Uncertainty Analysis for Criticality Safety Assessment and Validation
Class Dates	Mar 14 – 17, 2022
Location	Virtual - Oak Ridge National Lab, Oak Ridge, TN
Number of Attendees	6
Short Description	Sensitivity and uncertainty analysis methods provide advanced techniques for code and data validation including the identification of appropriate experiments, detailed quantification of bias and bias uncertainty, identification of gaps in available experiments, and the design of new experiments. The Sampler sequence within SCALE provides a flexible tool for quantifying uncertainties due to manufacturing tolerances as well as composition and dimensional uncertainties in criticality safety assessments. This 5-day training class provides a foundation on sensitivity and uncertainty analysis and applies these methods to criticality safety validation applications, as well as instruction on the use of Sampler for uncertainty quantification. Topics covered include: The TSUNAMI sensitivity and uncertainty analysis techniques for determining the sensitivity of the k-eff eigenvalue to cross section uncertainties using both multigroup and continuous-energy physics. SCALE's comprehensive cross section covariance data library, which is applied to these sensitivity coefficients to estimate the data-induced uncertainty in k-eff. The TSUNAMI-IP code, which determines the correlation between benchmark and application systems in terms of their shared sources of data-induced uncertainty.

	The USLSTATS trending analysis tool, which uses similarity coefficients from TSUNAMI-IP (among other parameters) to estimate the computational bias and bias uncertainty for design and licensing applications. The TSURFER data adjustment tool, which uses generalized linear least squares to adjust nuclear data parameters to minimize discrepancies between computed predictions and the results of integral experiments; these adjustments can then be used to estimate bias and bias uncertainty in design and licensing applications. The SAMPLER code for uncertainty assessment, which randomly samples nuclear data and/or system compositions and dimensions to quantify the uncertainty in system k-eff. This course will cover the theoretical basis for these analysis techniques and will also conduct exercises for attendees to familiarize themselves with these tools. It is recommended that attendees are familiar with the KENO Monte Carlo code or are experienced SCALE users, although these are not necessary prerequisites.

STATUS REPORT
on the
International Collaboration with the Atomic Weapons Establishment (AWE)

Reference			AWE Contributions and POCs			
AWE Reference	**Task Description**	**NCSP Reference**	**FY2018 AWE Contribution**	**AWE Technical POC**	**Collaborator POC**	**DOE Lab**
Analytical Methods						
AWE-AM1	Slide rule update	ORNL-AM6 LLNL-AM3 IRSN-AM5	Perform calculations; attend meetings; review analysis and reports	R. JONES	M. DULUC	ORNL
AWE effort currently on hold due to lack of resource.						
INTEGRAL EXPERIMENTS						
AWE-IE1	Inaugural international inter-comparison of nuclear accident dosimetry using Flattop	LLNL-IE1 IRSN-IE15	Co-author final report (CED-4b)	P. ANGUS	D. STONE	LLNL
Report completed and issued by C. Wilson before his departure in 2019.						
AWE-IE2	Development of Passive Neutron Spectrometer (PNS)		Fully commission TLD version of the PNS; Perform validation irradiations at NPL; develop unfolding tools for directionality	P. ANGUS	D. STONE	LLNL
3x PNS developed and built. Irradiations at NPL, planned for March 2020 (with potential involvement from US community), impacted by COVID-19 pandemic.						
AWE-IE3 **IER 406**	Cf-252 CAAS benchmark	LLNL-IE1 IRSN-IE28	Perform/support PNS(TLD) measurements with a shadow cone	P. ANGUS	D. HEINRICHS	LLNL
Dependent on completion of IE2.						
AWE-IE4 **IER 175**	Godiva-IV CAAS benchmark	ORNL-IE4 IRSN-IE27	Review of experiment design. Provide measurement capability as required	T. BIRKETT	J. SCORBY	ORNL
AWE involvement complete. Any further work dependent on future ORNL programme.						
AWE-IE5	Correction factor for dosimetry linked to orientation of the victim	LLNL-IE1 IRSN-IE29	Participate in experiment design; use PNS data to determine directional components of neutron fields (Godiva, Flattop, LLNL RCL)	P. ANGUS	D. HEINRICHS	LLNL
Dependent on completion of IE2 (unfolding tools for directionality). Linked with IE11 (International inter-comparison)						
AWE-IE6	ICSBEP shielding benchmark for shipping containers	LLNL-IE13 IRSN-IE36	Participate in experiment design; PNS(TLD) could be deployed as primary measurement device AWE to do some preliminary design	P. ANGUS	S. KIM	LLNL

Reference			AWE Contributions and POCs			
AWE Reference	**Task Description**	**NCSP Reference**	**FY2018 AWE Contribution**	**AWE Technical POC**	**Collaborator POC**	**DOE Lab**
Not started due to long lead time (2023) and dependence on PNS availability (see IE2). Scope definition required.						
AWE-IE7 **IER 153**	Measure fission neutron spectrum shape using threshold activation detectors	LANL-IE3	Provide input into foil selection; use AWE unfolding codes to provide independent analysis. TBC AWE to provide foil suggestions per MYERS	P. ANGUS	T. CUTLER B. MYERS	LANL
Awaiting LANL to advise on the extent of AWE involvement.						
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 on hold during the COVID-19 pandemic.						
AWE-IE9	(Neutron multiplicity experiments) AWE/LLNL NCT 5 year measurement campaign	LLNL-PROPOSAL 18	Participate in experiment design, measurements and reporting	N. KELSALL	D. HEINRICHS	LLNL
AWE has issued an internal report summarizing the results from analysis of bulk material measurements. Modified version of this report has been shared with the NCSP. MOD funding has been obtained for a measurement campaign at DAF, anticipated to take place in the latter half of the 2022-23 UK financial year.						
AWE-IE10	Enhanced methods of criticality accident dosimetry.	LLNL-IE1 IRSN-30 IRSN-33 Naval Dosimetry Center	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	International inter-comparison of nuclear accident dosimetry AWE to assist in preliminary design FY19 and FY20	LLNL-IE18 SNL-IE4	Produce experiment design; participate in exercise; produce final report. Repeat 2 - 3 years	P. ANGUS	D. STONE	LLNL
Next international inter-comparison is anticipated in 2022.						
AWE-IE12	CIDAAS testing	Proposal 20	Deploy AWE CIDAAS for test irradiation. Repeat 2 - 3 years	T. BIRKETT	J. SCORBY	LLNL
AWE successfully tested CIDAAS in May 2018 and provided support to CED-4. Technical report detailing the results has been issued. New design of visual alarm procured, which will be evaluated during the next available Testing Visit, planned for October 2022 onwards.						
AWE-IE13	Characterization of AFRRI TRIGA reactor radiation field	LLNL-IE18 SNL-IE4	Provide support to experiment design	P. ANGUS	A. ROMANYUKHA	LLNL

Reference			AWE Contributions and POCs			
AWE Reference	**Task Description**	**NCSP Reference**	**FY2018 AWE Contribution**	**AWE Technical POC**	**Collaborator POC**	**DOE Lab**
	AWE will provide onsite measurement					
AWE was fully prepared for July 2019 trial, prior to the regulatory shut-down of TRIGA. If trial is re-scheduled for 2022 AWE will be able to support it, provided sufficient notice is given.						
INFORMATION PRESERVATION AND DISSEMINATION						
AWE-IPD1	Conduct benchmark evaluations of legacy IEU integral experiments Requires no NCSP funding	LLNL-IPD1	Assess feasibility of sponsoring PhD; determine availability of data	R. JONES	D. HEINRICHS	LLNL
Considered unlikely to make any material progress.						
TRAINING AND EDUCATION						
AWE-TE1	Hands-on criticality safety training	ORNL-TE1 LANL-TE1 LLNL-TE1 LLNL-TE3 SNL-TE1 IRSN-TE1	AWE personnel to attend training course	R. JONES	D. BOWEN B. MYERS D. HEINRICHS G. HARMS S. EVO (IRSN)	ORNL
No AWE personnel attended courses during the reporting period. Currently no AWE personnel are expected to attend courses in the next quarter.						

Status report of international collaboration with IRSN for FY2022

	REFERENCE		IRSN Contribution / POC			
IRSN Reference	**Task Title**	**DOE Reference**	**FY 2022 IRSN Contribution**	**IRSN Technical POC**	**DOE Technical POC**	**DOE LAB**
ANALYTICAL METHODS						
IRSN-AM5	Update of the slide rule	ORNL-AM6 LLNL-AM3 AWE-AM1	Contribution to doses computation benchmarks, comparison with COG and SCALE results	M. DULUC	D. BOWEN D. HEINRICHS R. JONES	ORNL LLNL AWE
Q1 Status Meeting on 11/18 with UK AEA/IAEA/LLNL: use of FISPACT for the DFG dose rate estimation. Presentation of IRSN results. Sent SCALE IRSN data sets and results to ORNL. ORNL has identified the origin of the results inconsistencies: the neutron cross-section library used (302 energy groups) lacked accuracy at low energy. Using a 1597-group structure solved the problem. There is one case left (H/Pu=10) that requires further analysis. Meeting on 01/13/2022 with IRSN/ORNL/LLNL. Two NSCD full papers expected on February 1st. **Q2 Status** Two full papers accepted for presentation at NCSD. Johann HERTH did a presentation at the TPR meeting (invited for presentation to the ANS Winter Meeting).						
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
Q1 Status IRSN will make presentations at the Analytical Methods Working group meeting (February 2022). **Q2 Status**						

	REFERENCE		IRSN Contribution / POC			
IRSN Reference	**Task Title**	**DOE Reference**	**FY 2022 IRSN Contribution**	**IRSN Technical POC**	**DOE Technical POC**	**DOE LAB**
A presentation from Nicolas LECLAIRE to the last meeting (on February 14th) on k-eff intercomparison benchmark. IRSN work has also been included in J. Alwin presentation on 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
Q1 Status AMPX workshop to be organized. IRSN waiting for clearance approval. **Q2 Status** Clearance formality in progress. New ORNL task point of contact to be defined.						
IRSN-AM13	Benchmark intercomparison study	LLNL-AM5 ORNL-AM10 LANL-AM5 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
Q1 Status Analysis of the results for U233 and MCT series after extension of the number of common cases (FY2021) was done. Analysis of inconsistencies between results on all series is still ongoing. IRSN is waiting for LANL MCNP results with ENDF/B-VIII.0 library. Report concerning previous achievements (criticality benchmarks) is underway. No progress concerning the extension to other types of benchmarks (TSL, shielding..) (Extension FY22-02) **Q2 Status**						

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Presentation made at the TPR meeting on extended suite of U233 results. LANL sent MCNP results using ENDF/B-VIII.0 library to IRSN for all benchmarks shared with IRSN. SMF series from ICSBEP (Neptunium spheres) has been completed by IRSN and will be calculated by LLNL (Dave Heinrichs). Report concerning previous achievements (criticality benchmarks) is underway. Beta-eff were evaluated for a list of benchmarks provided by Dave Heinrichs; this list has been expanded by Nicolas Leclaire. IRSN MORET computations in progress, will be provided in Q3. =						
INTEGRAL EXPERIMENTS						
IRSN-IE6 **IER 306**	Rh experiment	SNL-IE1	IRSN is leading the design. In 2022, design optimization to accommodate Rh cost	N. LECLAIRE	G. HARMS	SNL
Q1 Status CED-2 report was sent to NCSP review team mid-0ctober. Comments from BJ Marshall received by IRSN. Waiting for further comments. **Q2 Status** Comments from BJ Marshall received and included by IRSN. Waiting for other reviewers comments.						
IRSN-IE7 **IER 305**	Mo experiment	SNL-IE1	IRSN has led the design. Participation in the experiments. Analysis of results.	N. LECLAIRE	G. HARMS	SNL
Q1 Status						

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IRSN Reference	**Task Title**	**DOE Reference**	**FY 2022 IRSN Contribution**	**IRSN Technical POC**	**DOE Technical POC**	**DOE LAB**
All sleeves were sent to Sandia. New grids are being manufactured to adapt the assembly pitch. SNL will write the CED-3a report. Waiting for opportunity to make experiments in 2022. Full NCSD paper (IRSN-SNL) will be presented (June 2022). **Q2 Status** Discussions took place with Gary Harms in February in order to define the date of the experiments. This could happen from June to August depending on the platform availability. Access clearance procedures for IRSN employees in progres.						
IRSN-IE11 **IER 297**	TEX - Hf baseline experiments (HEU)	LLNL-IE4	Contribution to ICSBEP evaluation of the baseline experiments	M. BROVCHENKO	C. PERCHER	LLNL
Q1 Status LLNL submitted an ICSBEP evaluation of the experiments. IRSN did a review of the document and will proceed in 2022 to model the benchmarks with MORET. **Q2 Status** No update. Benchmark modeling planned for Q3.						
IRSN-IE11 **IER 532**	TEX-Hf experiments	LLNL-IE4	Participation to experiments Contribution to the analysis of the experiments (CED-4)	M. BROVCHENKO	C. PERCHER	LLNL
Q1 Status No update. **Q2 Status**						

	REFERENCE		IRSN Contribution / POC			
IRSN Reference	**Task Title**	**DOE Reference**	**FY 2022 IRSN Contribution**	**IRSN Technical POC**	**DOE Technical POC**	**DOE LAB**
No information on experiment schedule.						
IRSN-IE27 **IER 498**	GODIVA CAAS benchmark	ORNL-IE1	Participation in the design. IRSN can provide technical support and instrumentation	F. TROMPIER	D. BOWEN R. CUMBERLAND	ORNL
Q1 Status: Waiting for information on schedule and type of instrumentations requested. **Q2 Status** No progress						
IRSN-IE30 **IER 538**	Intercomparison of criticality dosimetry around GODIVA	LLNL-IE1	Participation to the experiment. Provide IRSN NAD for irradiation, reading of dosimeters analysis of results on site	F. TROMPIER	D. HEINRICHS	LLNL AWE
Q1 Status: Experiments planned for the spring 2022. IRSN will participate as standard participant. Experiment is scheduled in May 2022. **Q2 Status** Experiments planned in August 2022 (22nd-25th). IRSN will participate as standard participant. Formalities and devices shipment in progress.						
IRSN-IE34 **IER 488**	MUSIC (HEU) critical and Subcritical measurements.	LANL-IE3	Analysis of results, contribution to CED4	W. MONANGE	J. HUTCHINSON	LANL
Q1 Status						

	REFERENCE		IRSN Contribution / POC			
IRSN Reference	**Task Title**	**DOE Reference**	**FY 2022 IRSN Contribution**	**IRSN Technical POC**	**DOE Technical POC**	**DOE LAB**
Experiment has been performed in 2021 February. IRSN is currently doing the data analysis and the simulations. Status will be discussed during the IRSN_LANL meeting planned on 01/21. **Q2 Status** Receipt of the Section 1 (experiment description) of the MUSIC benchmark for review. Review planned for September 2022.						
IRSN-IE41 **IER 499**	Thermal/Epithermal Experiments (TEX) with Chlorine and Lithium	LLNL-IE1	Participation in experiments design.	M. BROVCHENKO	D. HEINRICHS	LLNL
Q1 Status No update. **Q2 Status** No update.						
IRSN-IE42 **IER 121**	Neptunium Subcritical Observations (NeSO) experiment	LANL-IE3	Independent review of the ICSBEP evaluation.	W. MONANGE	J. HUTCHINSON	LANL
Q1 Status Experiment has been performed. IRSN is waiting for preliminary analysis from LANL. Status will be discussed during the IRSN_LANL meeting planned 01/21. **Q2 Status** No update						
IRSN-IE45 **IER 517**	Integral Experiments for Validation of Molybdenum Neutron Cross Sections on the whole energy spectrum	LANL-IE3	Participation in experiments design and CED reports. In 2022, participation to CED1 review	N. LECLAIRE	D. HAYES T. CUTLER	LANL
Q1 Status						

	REFERENCE		IRSN Contribution / POC			
IRSN Reference	**Task Title**	**DOE Reference**	**FY 2022 IRSN Contribution**	**IRSN Technical POC**	**DOE Technical POC**	**DOE LAB**
ANS winter meeting (Dec 2021) paper presenting the results of the CED-1 report was sent by J. Godda to IRSN. Discussions with IRSN on the collaboration will take place end of January 2022. Comparison of sensitivity profiles for configurations in thermal energy spectrum (MIRTE experiments) is proposed by IRSN. **Q2 Status** No update						
IRSN-IE46 **IER 518** **FY20-29**	High Multiplication Subcritical (Multiplicity) Benchmark Experiments	LLNL-IE1 SNL-IE1 LANL-IE3	Participation in experiments. IRSN will provide detectors for comparison.	W. MONANGE	D. HEINRICHS G. HARMS J. HUTCHINSON	LLNL SNL LANL
Q1 Status Experiment is planned for this year (2022). IRSN is waiting for experiments schedule. IRSN will use its detectors. **Q2 Status** Detector supports and detectors wells have been manufactured and received by IRSN. Device is ready. Shipment procedure to be started as soon as the dates of experiment are validated.. Clearance procedures for IRSN employees in progress.						
IRSN-IE47 **IER 537**	Copper Critical Experiment	LANL-IE3	Participation in CED reports. IRSN is interested to understand results of various experiments including ZEUS experiments results Contribution to CED2 review	J-B. CLAVEL	J. HUTCHINSON	LANL
Q1 Status Status on LANL progress will be done during IRSN_LANL meeting planned 01/21 **Q2 Status** No meeting during Q2						

	REFERENCE		IRSN Contribution / POC			
IRSN Reference	**Task Title**	**DOE Reference**	**FY 2022 IRSN Contribution**	**IRSN Technical POC**	**DOE Technical POC**	**DOE LAB**
IRSN-IE49 **IER 547**	TEX Pu with poly at very low temperatures - Surrogate measurement support	LLNL-IE1	Contribution to analysis of results for optimization of IER 479 design	J. BEZ	C. PERCHER	LLNL
Q1 Status First calculations started. IRSN has sent questions on information received at the end of 2021 (email requesting data sent 01/05/2022). Some data updates are necessary from LLNL. **Q2 Status** Some configurations have been identified as interesting. A technical point will be set up to discuss differences between IRSN and LLNL results and experimental questions.						
IRSN-IE50	Pulse Neutron Experiments for Resonance Parameter Evaluation of Absorbing Materials	FY22-15	Evaluation and support for experiments	L. LEAL	C. PERCHER/D. SIEFMAN	LLNL
Q1 Status Ongoing activity: LLNL has carried out investigation of historical experiments employing measurement technique that are envisioned in this task. **Q2 Status** No update.						
IRSN-IE51	Thermal/Epithermal Experiments (TEX)-Plutonium Additional Mixed Spectrum Configurations	FY22-16	Contribution to CED1 report.	M. BROVCHENKO	C. PERCHER	LLNL
Q1 Status No update. **Q2 Status** No update.						

	REFERENCE		IRSN Contribution / POC			
IRSN Reference	**Task Title**	**DOE Reference**	**FY 2022 IRSN Contribution**	**IRSN Technical POC**	**DOE Technical POC**	**DOE LAB**
INFORMATION PRESERVATION AND DISSEMINATION						
IRSN-IPD1	ICSBEP reviewing	LLNL-IPD1	IRSN ICSBEP reviewing tasks are reported in the IE tasks	S. PIGNET	D. HEINRICHS	LLNL

Q1 Status

Participation to the December 2021 status meeting.

Q2 Status

IRSN will work on the reevaluation of PU-SOL-THERM-030 ICSBEP series involving solutions of plutonium nitrate (1.5 % ^{240}Pu) in annular cylinders along with a reevaluation of MIRTE experiments in order to make consistent the treatment of uncertainties for LCT-074, LCT-106 with LCT-110 series approved at the last TRG meeting.

NUCLEAR DATA						
IRSN-ND1	Contribution to new evaluations	ORNL-ND1 NNL-ND1 RPI-ND1	Contribution to new evaluations and validation in accordance with the milestone schedule in Appendix B	L. LEAL	D. BOWEN T. TRUMBULL	ORNL NNL RPI

Q1 Status

Work on Mo-95 resonance evaluation from LANL, benchmark testing and RP improvements

Finished U233 RR evaluation + RPC. Work on the URR underway;

Work with ORNL on Hf sample preparation for new measurements;

Work on the RR + URR for Pu239 underway;

Rh103 completed and delivered to BNL;

Work on the URR for Gd155 and Gd157;

Work on the Fe54 and Fe56 RR evaluation;

	REFERENCE		IRSN Contribution / POC			
IRSN Reference	**Task Title**	**DOE Reference**	**FY 2022 IRSN Contribution**	**IRSN Technical POC**	**DOE Technical POC**	**DOE LAB**
Work on the F19 resonance evaluation. **Q2 Status** Benchmark calculations for systems with Mo have been done. Results indicate an improvement on the Mo-95 evaluation Benchmark results shows improvement on the Pu-239 resonance evaluation for burnup calculations; Progress has been made on the U-233 URR evaluation; NEA/data bank offered to contact INRNE, Sofia/Bulgaria to obtain Hf enriched samples;						
TRAINING AND EDUCATION						
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
Q1 Status Waiting for visibility on travel. (Travel plans contingent upon the sanitary situation.) **Q2 Status** 2 IRSN employees will participate on August session.						

Additional information:

- TEX-MOX : IRSN works on a design addressing heat issues. Several technical meetings with LANL and LLNL staff focused on the possible thermo-mechanical solutions. Answers to comments on the CED-1 were sent to LANL. CED2 may be available for NCSP comments on December 2022, if NCSP agrees to schedule the experiments in 2023 or 2024.