INTERAGENCY AGREEMENT	1. IAA NO. NRC-HQ-60-15-D-0014/M0003	PAGE 1 OF 12

2. ORDER NO.	3. REQUISITION NO.	4. SOLICITATION NO.
	NMSS-17-0191	

5. EFFECTIVE DATE	6. AWARD DATE	7. PERIOD OF PERFORMANCE
09/18/2017	09/21/2017	08/26/2015 TO 12/31/2019

8. SERVICING AGENCY
ARGONNE NATIONAL LAB
ALC:
DUNS: +4:
US DEPARTMENT OF ENERGY
9800 SOUTH CASS AVENUE
LEMONT IL 60439

POC SEAN SEAMON
TELEPHONE NO. 630-252-2077

9. DELIVER TO
TANYA OXENBERG
US NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REGULATORY RESEARCH
11555 ROCKVILLE PIKE
ROCKVILLE MD 20852

10. REQUESTING AGENCY
ACQUISITION MANAGEMENT DIVISION
ALC: 31000001
DUNS: 040535809 +4:
US NUCLEAR REGULATORY COMMISSION
ONE WHITE FLINT NORTH
11555 ROCKVILLE PIKE
ROCKVILLE MD 20852-2738

POC Sandra Nesmith
TELEPHONE NO. 301-415-6836

11. INVOICE OFFICE
US NUCLEAR REGULATORY COMMISSION
TWO WHITE FLINT NORTH
11545 ROCKVILLE PIKE
MAILSTOP T9-B07
ROCKVILLE MD 20852-2738

12. ISSUING OFFICE
US NRC - HQ
ACQUISITION MANAGEMENT DIVISION
MAIL STOP TWFN-5E03
WASHINGTON DC 20555-0001

13. LEGISLATIVE AUTHORITY
Energy Reorganization Act of 1974

14. PROJECT ID

15. PROJECT TITLE
SUPPORT FOR THE RESIDUAL RADIOACTIVITY (RESRAD) FA

16. ACCOUNTING DATA
See Block 18

17. ITEM NO.	18. SUPPLIES/SERVICES	19. QUANTITY	20. UNIT	21. UNIT PRICE	22. AMOUNT
	Master IAA: N/A ANL ID: P-2015-15147.01 TITLE: SUPPORT FOR RESRAD FAMILY OF CODES SUMMARY OF CHANGES: The purpose of this modification is to: (1) provide within scope changes; (2) extend the period of performance by 24 months; (3) increase the authorized ceiling by $605,000.00; and (4) provide incremental funding in the amount of Continued ...				

23. PAYMENT PROVISIONS	24. TOTAL AMOUNT
	$455,000.00

25a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (SERVICING)		26a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (REQUESTING)	
		Sandra R. Nesmith	
25b. NAME AND TITLE	**25c. DATE**	**26b. CONTRACTING OFFICER**	**26c. DATE**
		SANDRA R. NESMITH	09/21/2017

$455,000.00.

Accordingly the agreement is modified as follows:

1. Reference to the "Statement of Work," is hereby deleted in its entirety and replaced with the following Statement of Work attached to this Modification No. 3 entitled "Statement of Work, Rev. 1."

2. The period of performance has changed from 8/26/15 - 12/31/17 to 8/26/15 - 12/31/19.

3. The new authorized cost ceiling has increased by $605,000.00 from $926,361.00 to $1,531,361.00.

4. Incremental funding in the amount of $455,000.00 is provided increasing the total obligations for this agreement from $926,361.00 to $1,381,361.00

All other terms and conditions remain unchanged.

Attachment: Statement of Work, Rev. 1

ANL Principal Investigator: Charley Yu, 630-252-5761, cyu@anl.gov

NRC COR: Tanya Oxenberg, 301-415-2437, Tanya.oxenberg@nrc.gov

ACCOUNTING INFO:

2017-C0200-FEEBASED-50-50D009-1044-35-4-116-253A-35-4-116-1044 Funded: $114,000

2017-C0200-FEEBASED-50-50D009-1044-35-4-195-252A-35-4-195-1044 Funded: $341,000

DUNS: 040535809 TAS: 31X0200.320
ALC: 31000001

STATEMENT OF WORK

REVISION 1

NRC Agreement Number	NRC Agreement Modification Number	NRC Task Order Number (If Applicable)	NRC Task Order Modification Number (If Applicable)
NRC-HQ-60-15-D-0014	3	N/A	N/A

Project Title		
Support for RESRAD Family of Codes		
Job Code Number	**B&R Number**	**DOE Laboratory**
1044		Argonne National Laboratory
NRC Requisitioning Office		
Office of Nuclear Regulatory Research		

NRC Form 187, Contract Security and Classification Requirements ☐ Applicable ☐ NotApplicable	☐ Involves Proprietary Information ☐ Involves Sensitive Unclassified
☒Non Fee-Recoverable	☐Fee-Recoverable (If checked, complete all applicable sections below)
Docket Number (If Fee-Recoverable/Applicable)	**Inspection Report Number (If Fee Recoverable/Applicable)**
Technical Assignment Control Number (If Fee-Recoverable/Applicable)	**Technical Assignment Control Number Description (If Fee-Recoverable/Applicable)**

1.0 BACKGROUND

The United States Nuclear Regulatory Commission (US NRC) has used probabilistic dose assessment codes to fulfil the agency's need for conducting screening as well as site-specific and risk-informed radiological impact analysis for demonstrating compliance with the License Termination Rule, 10 CFR Part 20, Subpart E. The codes include, but not limited to, RESRAD, RESRAD-OFFSITE and RESRAD BUILD, also known as the RESRAD Family of Codes. RESRAD and RESRAD-OFFSITE compute the release of radionuclides from a source or contaminated zone. Once released from the contaminated zone, they simulate the transport of contaminants through ground and surface water to various on- or off-site locations. RESRAD-BUILD is used to estimate doses resulting from exposure to residual radioactivity in buildings. While RESRAD-OFFSITE 3.1 offers several new source release models not available in previous versions of the code, additional source release functions would increase the utility of the code in simulating releases from a variety of sources including those from low-level waste

disposal facilities. In addition, all codes could use updated values and distributions for their parameters.

2.0 OBJECTIVE

The objective of the agreement is to continue to update and develop the RESRAD Family of Codes and associated documentation. This includes upgrading the solubility and diffusion limited source release models, and performing the associated quality assurance activities to RESRAD-OFFSITE. Another objective is to update the default parameter values and distributions in RESRAD, RESRAD-OFFSITE, and RESRAD-BUILD. Yet another objective is to re-examine the source release model to surface water and upgrade it to have realistic dose results for the surface water pathways. A final objective is to develop a RESRAD-OFFSITE test case using LLW source-term and compare with results using other commonly used platform code(s).

3.0 SCOPE OF WORK

Argonne National Laboratory (ANL) must provide all resources necessary to accomplish the tasks and deliverables described in this statement of work (SOW). This includes all phases of the RESRAD Family of Computer Code activities including development, maintenance, distribution and training.

4.0 SPECIFIC TASKS

ANL must perform the following tasks:

Task 1: Update Default parameter values and distributions in RESRAD, RESRAD-OFFSITE, and RESRAD-BUILD

ANL shall update default RESRAD, RESRAD-OFFSITE, and RESRAD-BUILD, parameter values and parameter distributions, as appropriate. The methodology for ranking parameters including their relevance in dose calculations and in the influence on dose variables is over 15 years old. In addition, because there are over 200 parameters values and 70 distributions for the RESRAD Family of Codes, ANL shall work with NRC to identify and prioritize what parameters and distributions should be updated.

Argonne is working with the Department of the Army to update ANL/EVS/TIM-14/4, Data Collection Handbook to Support Modelling Impacts of Radioactive Material in Soil and Building Structures. This handbook impacts the RESRAD family of codes parameter sets. Therefore, there is a need for multi-agency discussions to ensure the Data Collection Handbook, NUREG/CR-6692 and all associated guidance documents are aligned for future updates.

NRC staff will have opportunity to review the sensitivity analyses, parameter updates, and development of default parameter templates for use in RESRAD and RESRAD-BUILD and if needed, make adjustments to the default parameters. Development of default parameter templates will assist NRC staff and licensees with incorporating NUREG/CR-5512 dose modeling methodology (e.g., exposure scenarios and approved behavioral parameters developed for DandD) into RESRAD, as well as update other parameters based on the latest information available in the literature.

Task 1 deliverables include documented monthly discussions and a written high level plan. This plan will be used to upgrade the code, quality assurance (QA) and associated documentation in a comprehensive manner as described in Task 4.

Task 2: Upgrade Solubility and Diffusion Limited Source Release Models to RESRAD-OFFSITE

ANL shall explicitly simulate a solubility limited release model in RESRAD-OFFSITE 3.1. NUREG/CR-7127 was published in December 2013 and describes the New Source Term Model for the RESRAD-OFFSITE Code, Version 3. It documents a source release model for handling containerized waste material. In addition, NUREG/CR-7189, published in April 2015, describes several source release options including first order and equilibrium desorption release models. RESRAD-OFFSITE 3.1 includes those source release options and has the added capability to delay the release and allow changes to release rates over time. Although the user can mimic a solubility limited release using the source release models and parameters currently available in RESRAD-OFFSITE 3.1, a solubility limited release is not explicitly simulated in the computer code.

Furthermore, diffusion-limited releases are not a source release option in RESRAD-OFFSITE computer but may be useful for modeling releases from engineered systems such as cementitious waste forms. Update to the source release models should include the option to specify solubility limits and changes to solubility limits over time. The capability to model diffusion-limited release should also be included in the code with options to specify related diffusion parameters. These source release options increase the utility of the code in modeling waste release for higher-risk sites where solubility controls and diffusion-limited releases may be applicable.

ANL shall also expand the complexity of models to include discretization of solubility changes over time or changes to RESRAD OFFSITE input parameters.

Task 2 deliverables include documented monthly discussions and a written high level plan. This plan will be used to upgrade the code, quality assurance (QA) and associated documentation in a comprehensive manner as described in Task 4.

Task 3: Re-examine the source release model to surface water and upgrade it to have realistic dose results for the surface water pathways

ANL shall re-examine the source release model to surface water (e.g.; lake, pond, and river). The goal would be to upgrade the model to have realistic dose results for the surface water pathways. As such, ANL will present a short, 2-3 page plan that outlines the options and path forward to the US NRC. This document shall be delivered for review and comment. After NRC approves of the plan, ANL shall commence with the preferred option of the US NRC.

As with Tasks 1, and 2, this plan may also include restructuring the NUREG or developing supplemental documents to document the re-examined source release model. Therefore, Task 3 deliverables include documented monthly discussions and a written high level plan. This plan will be used to upgrade the code, quality assurance (QA) and associated documentation in a comprehensive manner as described in Task 4.
.

Task 4: Computer Code Development, Quality Assurance Testing and Software Documentation

ANL shall upgrade the RESRAD, RESRAD-OFFSITE and RESRAD BUILD computer codes based on the outcomes of Task 1, 2, 3 and 4. TANL shall also restructure the NUREGs and other guidance documents to align with these tasks and standard computer code documentation guidance that includes: 1) User Guide, 2) Technical Basis Documents and 3) Quality Assurance Documents. ANL shall develop a NUREG/CR report from Tasks 1-4.

Additionally it is anticipated that the computer codes and guidance documents will be reviewed and revised periodically to align with updates of the code and to incorporate lessons learned from NRC staff, licensee exercises, training sessions and international counterpart.

Task 5: Technical Support and Consultation

ANL shall provide technical assistance to the COR including knowledge management activities, code modernizations plans (i.e. maintainability, readability, and extendibility), and assisting in the diagnosis of RESRAD Family of Codes coding errors and problem. ANL shall also provide technical support to the NRC staff in the form of technical presentations and tutorial sessions, conference calls, meetings, and written correspondence that will assist the NRC staff with code development and maintenance functions. All technical assistance requests will be coordinated through the COR.

Task 6: Technical Support and Consultation for RAMP

ANL must provide technical assistance to support RAMP Coordination and Training of Advanced Modules at the fall 2017 meeting in October and moving RESRAD into RAMP.

5.0 DELIVERABLES AND/OR MILESTONES SCHEDULE

Task Number	Deliverable/Milestone Description				Additional Comments
N/A	Kickoff Meeting (within 30 days of award)				
1 Update Default parameter values and distributions in RESRAD, RESRAD-OFFSITE, and RESRAD-BUILD	Monthly Documented Teleconference Discussions of Parameter Values and Distributions				MLSRs are due by the 20th of each month documenting progress.
	Draft Plan 4 months after award	NRC review and comment 6 months after award	Task 1 changes provided to NRC for review (i.e., beta version) four weeks after award of contract modification.	Finalized computer code and documentation Per Task 4	
2 Upgrade Solubility and Diffusion Limited Source Release Models to RESRAD-OFFSITE	Monthly Documented Teleconference Discussions of Solubility and Diffusion Limits				MLSRs are due by the 20th of each month documenting progress.
	Draft Plan 4 months after award	NRC reviews and comments 6 months after award	Task 2 changes provided to NRC for review (i.e., beta version) four weeks after award of contract modification.	Finalized computer code and documentation Per Task 4 below	
3 Re-examine the source release model to surface water and upgrade it to have realistic dose results for	Monthly Documented Teleconference Discussions of source release model to surface water				MLSRs are due by the 20th of each month documenting progress.
	Draft Plan 4 months after award	NRC Review and Comment 6 months after award	Task 3 changes provided to NRC for review (i.e., beta version) four weeks after	Finalized computer code and documentation Per Task 4 below	

the surface water pathways			award of contract modification.		
	Review of Documentation - Ongoing				
4 Computer Code Development, Quality Assurance Testing and Software Documentation	Monthly Documented Teleconference Discussions of Computer Code and NUREG/CR revisions for Task 1, 2, and 3				MLSRs are due by the 20th of each month documenting progress.
	Draft Computer Code, QA testing and NUREG/CRs Documentation 12months	NRC Testing of code, review and comment of documentation 15 months after award	Final Computer Code and Documentation	23 months after award	
5 Technical Support and Consultation	Ongoing				MLSRs are due by the 20th of each month documenting progress.
7 RAMP	Four months after award of modification				MLSRs are due by the 20th of each month documenting progress.

6.0 TECHNICAL AND OTHER SPECIAL QUALIFICATIONS REQUIRED

This work requires staff with expertise in the development of the RESRAD Family of Codes, including RESRAD, RESRAD-OFFSITE and RESRAD BUILD. In addition, the work requires staff to have expertise in regulatory issues of residual radioactivity from NRC licensee activities, environmental transport pathway analysis, radiation dosimetry, hydrology, surface water models and low level waste source terms.

Another requirement is for staff to have the ability to evaluate residual radioactive releases and associated doses to members of the public as required by 10 CFR Part 20. Yet, another requirement is to have experience in Software Quality Control requirements and the knowledge of publishing NUREG.

7.0 MEETINGS AND TRAVEL

ANL shall carry out domestic travel. The travel frequency is approximately 1-2 times a year. The purpose is for project meetings and/or training to NRC Headquarters. The number of contactor staff will be 2-3 persons for 3-5 days. If the travel requires training the number of staff may increase to 3-4 persons. ANL shall develop a trip report and submit it with the Monthly Letter Status Report for that month.

Foreign travel for the DOE laboratory personnel requires a 60-day lead time for NRC approval. For prior approval of foreign travel, the DOE laboratory shall submit an NRC Form 445, "Request for Approval of Official Foreign Travel." NRC Form 445 is available in the MD 11.7 Documents library and on the NRC Web site at: http://www.nrc.gov/reading-rm/doc-collections/forms/. Foreign travel is approved by the NRC Executive Director for Operations (EDO).

All travel requires written Government approval from the CO, unless otherwise delegated to the COR.

8.0 REPORTING REQUIREMENTS The DOE Laboratory is responsible for structuring the deliverable to follow agency standards. The current agency standard is Microsoft Office Suite 2010. The current agency Portable Document Format (PDF) standard is Adobe Acrobat 9 Professional. Deliverables must be submitted free of spelling and grammatical errors and conform to requirements stated in this section.

Monthly Letter Status Reports

In accordance with Management Directive 11.7, NRC Procedures for Placement and Monitoring of Work with the U.S. Department of Energy, the DOE Laboratory must electronically submit a Monthly Letter Status Report (MLSR) by the 20th day of each month to the Contracting Officer Representative (COR) with copies to the Contracting Officer (CO) and the Office Administration, Administration Management Division to ContractsPOT.Resource@nrc.gov. If a project is a task ordering agreement, a separate MLSR must be submitted for each task order with a summary project MLSR, even if no work has been performed during a reporting period. Once NRC has determined that all work on a task order is completed and that final costs are acceptable, a task order may be omitted from the MLSR.

The MLSR must include the following: agreement number; task order number, if applicable; cost center number; title of the project; project period of performance; task order period of performance, if applicable; COR's name, telephone number, and e-mail address; full name and address of the performing organization; principal investigator's name, telephone number, and e-mail address; and reporting period. At a minimum, the MLSR must include the information discussed in Attachment 1. The preferred format for a MLSR is in Attachment 1.

9.0 PERIOD OF PERFORMANCE

The period of performance for this work is from August 26, 2015 through December 31, 2019.

10.0 CONTRACTING OFFICER'S REPRESENTATIVE

The COR monitors all technical aspects of the agreement/task order and assists in its administration. The COR is authorized to perform the following functions: assure that the DOE Laboratory performs the technical requirements of the agreement/task order; perform inspections necessary in connection with agreement/task order performance; maintain written and oral communications with the DOE Laboratory concerning technical aspects of the agreement/task order; issue written interpretations of technical requirements, including Government drawings, designs, specifications; monitor the DOE Laboratory's performance and notify the DOE Laboratory of any deficiencies; coordinate availability of NRC-furnished material and/or GFP; and provide site entry of DOE Laboratory personnel.

Contracting Officer's Representative
Name: Tanya Palmateer Oxenberg
Agency: U.S. Nuclear Regulatory Commission
Office: Office of Nuclear Regulatory Research
Mail Stop: T10B58Washington, DC 20555-0001
E-Mail: tanya.oxenberg@nrc.gov
Phone: -301-415-2437

Alternate Contracting Officer's Representative
Name: Stephanie Bush-Goddard
Agency: U.S. Nuclear Regulatory Commission
Office: Office of Nuclear Regulatory Research
Mail Stop: T10B58
Washington, DC 20555-0001
E-Mail: Stephanie.Bush-Goddard@nrc.gov
Phone: 301-415-0755

11.0 MATERIALS REQUIRED (TYPE N/A IF NOT APPLICABLE)

N/A

12.0 NRC-FURNISHED PROPERTY/MATERIALS (TYPE N/A IF NOT APPLICABLE)

N/A

13.0 RESEARCH QUALITY (TYPE N/A IF NOT APPLICABLE)

The quality of NRC research programs are assessed each year by the Advisory Committee on Reactor Safeguards. Within the context of their reviews of RES programs, the definition of quality research is based upon several major characteristics:

Results meet the objectives (75% of overall score)

Justification of major assumptions (12%)
Soundness of technical approach and results (52%)
Uncertainties and sensitivities addressed (11%)

Documentation of research results and methods is adequate (25% of overall score)
Clarity of presentation (16%)
Identification of major assumptions (9%)

It is the responsibility of the DOE Laboratory to ensure that these quality criteria are adequately addressed throughout the course of the research that is performed. The NRC COR will review all research products with these criteria in mind.

14.0 STANDARDS FOR CONTRACTORS WHO PREPARE NUREG-SERIES MANUSCRIPTS (TYPE N/A IF NOT APPLICABLE)

The U.S. Nuclear Regulatory Commission (NRC) began to capture most of its official records electronically on January 1, 2000. The NRC will capture each final NUREG-series publication in its native application. Therefore, please submit your final manuscript that has been approved by your NRC Project Manager in both electronic and camera-ready copy.
The final manuscript shall be of archival quality and comply with the requirements of NRC Management Directive 3.7 “NUREG-Series Publications.” The document shall be technically edited consistent with NUREG–1379, Rev. 2 (May 2009) "NRC Editorial Style Guide." The goals of the "NRC Editorial Style Guide" are readability and consistency for all agency documents.

All format guidance, as specified in NUREG-0650, “Preparing NUREG-Series Publications," Rev. 2 (January 1999), will remain the same with one exception. You will no longer be required to include the NUREG-series designator on the bottom of each page of the manuscript. The NRC will assign this designator when we send the camera-ready copy to the printer and will place the designator on the cover, title page, and spine. The designator for each report will no longer be assigned when the decision to prepare a publication is made. The NRC's Publishing Services Branch will inform the NRC Project Manager for the publication of the assigned designator when the final manuscript is sent to the printer.
For the electronic manuscript, the Contractor shall prepare the text in Microsoft Word, and use any of the following file types for charts, spreadsheets, and the like.

File Types to be Used for NUREG-Series Publications	
File Type	File Extension
Microsoft®Word®	.doc
Microsoft® PowerPoint®	.ppt
Microsoft®Excel	.xls
Microsoft®Access	.mdb
Portable Document Format	.pdf

This list is subject to change if new software packages come into common use at NRC or by our licensees or other stakeholders that participate in the electronic submission process. If a

portion of your manuscript is from another source and you cannot obtain an acceptable electronic file type for this portion (e.g., an appendix from an old publication), the NRC can, if necessary, create a tagged image file format (file extension.tif) for that portion of your report. Note that you should continue to submit original photographs, which will be scanned, since digitized photographs do not print well.

If you choose to publish a compact disk (CD) of your publication, place on the CD copies of the manuscript in both (1) a portable document format (PDF); (2) a Microsoft Word file format, and (3) an Adobe Acrobat Reader, or, alternatively, print instructions for obtaining a free copy of Adobe Acrobat Reader on the back cover insert of the jewel box.

15.0 OTHER CONSIDERATIONS

References
N/A

Access to Non-NRC Facilities/Equipment

N/A

Applicable Publications
N/A

Controls over document handling and non-disclosure of materials
N/A