INTERAGENCY AGREEMENT	1. IAA NO NRC-HQ-60-15-T-0024	PAGE OF 1 | 3
2. ORDER NO	3. REQUISITION NO. RES-15-0456	4. SOLICITATION NO.
5. EFFECTIVE DATE 08/20/2015	6. AWARD DATE 08/20/2015	7. PERIOD OF PERFORMANCE 08/20/2015 TO 09/30/2016

8. SERVICING AGENCY
OAK RIDGE NATIONAL LAB
ALC:
DUNS: 012075755 +4:
US DEPARTMENT OF ENERGY
OAK RIDGE NATION LABORATORY SITE OFFICE
BUILDING 4500N MS 6269
PO BOX 2008
OAK RIDGE TN 37831-6269
POC Deborah Garland, CO
TELEPHONE NO. (865) 241-9566

9. DELIVER TO
DON ALGAMA
MAIL STOP TWFN 10-B7
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 Jeffrey R. Mitchell
TELEPHONE NO. 301-415-5074

11. INVOICE OFFICE
US NUCLEAR REGULATORY COMMISSION
ONE WHITE FLINT NORTH
11555 ROCKVILLE PIKE
MAILSTOP O3-E17A
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
LATTICE PHYSICS CODE PERFORMANCE ASSESSMENT FOR LI

16. ACCOUNTING DATA
2015-X0200-FEEBASED-60-60D003-11-6-213-1045-253D

17. ITEM NO.	18. SUPPLIES/SERVICES	19. QUANTITY	20. UNIT	21. UNIT PRICE	22. AMOUNT
	TASK ORDERING AGREEMENT: NRC-HQ-60-14-D-0005 TASK ORDER NUMBER: NRC-HQ-60-15-T-0024 The NRC and the DOE Lab (ORNL) hereby enter into this Agreement/Task Order, NRCHQ6014D0005 - NRCHQ6015T0024, for the project entitled, "Lattice Physics Code Performance Assessment for Licensing Reviews" The performance period for this agreement shall commence on August 20, 2015 and will expire on September 30, 2016. Continued ...				

23. PAYMENT PROVISIONS

24. TOTAL AMOUNT
$150,000.00

25a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (SERVICING)

25b. NAME AND TITLE
Deborah L. Garland, Contracting Officer

25c. DATE
8/19/15

26a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (REQUESTING)

26b. CONTRACTING OFFICER
JEFFREY R. MITCHELL

26c. DATE
8/13/2015

TEMPLATE - ADM001 SUNSI REVIEW COMPLETE AUG 27 2015 ADM002

NRC Contracting Officers Representative (COR):
Don Algama and Mourad Aissa
ORNL Project Manager: Stephen M. Bowman and Matt Jessee

Consideration and Obligations:
(a) Authorized Cost Ceiling $200,000.00

(b) The amount presently obligated with respect to this DOE Agreement is $150,000.00. When and if the amount(s) paid and payable to the DOE Laboratory hereunder shall equal the obligated amount, the DOE Laboratory shall not be obligated to continue performance of the work unless and until the NRC Contracting Officer shall increase the amount obligated with respect to this DOE Agreement. Any work undertaken by the DOE Laboratory in excess of the obligated amount specified above is done so at the DOE Laboratory's sole risk.

The following documents are hereby made part of this Agreement:
Attachment No. 1: Statement of Work

The issuance of this Task Order does not amend any terms or conditions of the subject Agreement.
Master IAA: NRCHQ6014D0005

00001	Authorized Cost Ceiling Line Item Ceiling$200,000.00 Incrementally Funded Amount: $150,000.00	200,000.00

This agreement is entered into pursuant to the authority of the Energy Reorganization Act of 1974, as amended (42 U.S.C 5801 et seq.). This work will be performed in accordance with the NRC/DOE Memorandum of Understanding dated November 24, 1998. To the best of our knowledge, the work requested will not place the DOE and its contractor in direct competition with the domestic private sector.

[ ] Fee Recoverable Work
[x] Non-fee Recoverable Work

Continued ...

Notwithstanding the agreement effective dates and period of performance start dates stated elsewhere in the agreement, the effective date of the agreement and start date of the period of performance are the last date of signature by the parties.

The total amount of award: $200,000.00. The obligation for this award is shown in box 24.

STATEMENT OF WORK

NRC Agreement Number	NRC Agreement Modification Number	NRC Task Order Number (If Applicable)	NRC Task Order Modification Number (If Applicable)
NRC-HQ-60-14-D-0005		NRC-HQ-60-15-T-0024	

Project Title
Lattice Physics Code Performance Assessment for Licensing Reviews

Job Code Number	B&R Number	DOE Laboratory
N/A		ORNL

NRC Requisitioning Office
RES

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

1.0 BACKGROUND

Regulatory Context:

The Nuclear Regulatory Commission (NRC) relies on SCALE as a robust, state-of-the-art nuclear analysis computer code system that ensures independent review of licensee submittals and accurate investigations of reactor and fuel phenomena important to nuclear safety.

This code supports licensing evaluations that are being performed at the NRC that rely on independent lattice physics parameters. Lattice physics data are foundational for characterizing the fuel, and these calculations serve as the first step in the analysis of plant and fuel performance for accident analyses (e.g. PARCS/TRACE, MELCOR and MACCS2). Current reliance on the SCALE lattice physics codes, TRITON and Polaris, is based on limited code assessments and experience from prior NRC/RES projects (e.g. JCNs Y6846, V6098, V6222, V6361, V6453) and journal articles and conference papers. The issue here is the potential for gaps in assessments and information being distributed over a variety of sources. Thus there is a strong need to provide reference performance assessments, in an easily accessible format, for user licensing calculations.

Technical Context:

Development, maintenance and enhancements of the SCALE lattice physics methods have been performed under contracts such as JCN N6445, including: investigation of lattice modeling approaches for LWRs (Task 1); extending the validation against higher order methods (Task 2) and steady-state operating data (Task 3); development of improved TRITON capabilities (Task 4); and maintenance of SCALE lattice physics methods (Task 5). More recently, JCN V6182 improved TRITON capabilities to provide faster execution times for nuclear fuel assembly lattice calculations, while preserving the accuracy of the cross section computing and collapsing processes. Currently the new Polaris LWR lattice physics code is being developed under V6449 T0004. Some code validation work has been performed with PWR steady-state operation data, and is on-going under V6449 T0002.

However there is no dedicated documentation that allows NRC staff to assess the applicability of a problem to the capability of the code. Further there is currently no existing methodology to efficiently understand potential system biases and uncertainties.

2.0 OBJECTIVE

The purpose of this task is to complete a performance assessment of SCALE lattice physics codes for LWR calculations and to document it in a NUREG/CR. This NUREG/CR will serve as a reference tool for NRC staff when performing licensing calculations.

3.0 SCOPE OF WORK

The DOE Laboratory must provide all resources necessary to accomplish the tasks and deliverables described in this statement of work (SOW).

The tasks below describe the needs to support the Agencies mission.

4.0 SPECIFIC TASKS

The DOE Laboratory must perform the following tasks:

Task 1: Develop List of Benchmark Calculations

In this task, a list of benchmark calculations is to be developed. These benchmark calculations are to cover the LWR application space for UO2 and MOX fuel , where available, and should include critical experiments such as, KRITZ from International Criticality Safety Benchmark Evaluation Project (ICSBEP) Handbook, isotope depletion benchmarks from RCA measurements such as Takahama-3 and Calvert Cliffs-1, numerical benchmarks such as VERA-CS and CASL depletion verification for pin cell calculations, PWR assembly test matrix for fuel assembly calculations, etc.

The effort shall be coordinated with the PARCS development team to ensure consistency across the NRC's calculation tools, and in particular to ensure that the appropriate parameters for NRC needs are being assessed. A draft of the document shall be provided to the NRC for review and comment before being made final.

Deliverable: 1. Letter report describing the development and implementation of this task, limitations if any, areas of application, why a new module was created or not, any input decks developed, etc. Also provide with the deliverable any input decks as they are developed, preferably annotated with the coder's intent, and again the final versions with the report. 2. A road map that clearly breaks down this task with deliverable dates before work is to be started.

Estimated completion date: 2 month

Task 2: Benchmark Analysis

In this task, the final benchmark models are to be run using SCALE TRITON and Polaris. Where necessary/appropriate, reference solutions using SCALE CE-KENO and where possible SHIFT, shall be made available. Before starting the analysis, a list of parameters and assumptions to form the basis of the benchmark analysis shall be iterated with the NRC.

Deliverable: 1. Letter report describing the development and implementation of this task, limitations if any, areas of application, why a new module was created or not, any input decks developed, etc. Also provide with the deliverable any input decks as they are developed, preferably annotated with the coder's intent, and again the final versions with the report. 2. A road map that clearly breaks down this task with deliverable dates before work is to be started.

Estimated completion date: 5 months

Task 3: Documentation

In this task, the results of Task 2 are to be consolidated into a NUREG/CR. Any differences are to be clearly described and have a clear disposition. A draft of the NUREG/CR is expected to be available for review before being made final. The NUREG shall cover such item as the codes assumptions and how they were tested, application space tested, and their respective bases. Included in this NUREG shall be all the input decks for the TRITON, Polaris and CE-KENO runs.

Deliverable: 1. Letter report describing the development and implementation of this task, limitations if any, areas of application, why a new module was created or not, any input decks developed, etc. Also provide with the deliverable any input decks as they are developed, preferably annotated with the coder's intent, and again the final versions with the report. 2. A road map that clearly breaks down this task with deliverable dates before work is to be started.

Estimated completion date: 12 months after project start (draft 10 months after project start)

Task 4: Technical Support

Technical support and on-call assistance in the operation of the SCALE system shall be provided to NRC staff identified by the NRC COR. ORNL shall prepare monthly letter status

reports, interface with NRC staff, and perform the necessary administrative functions in support of this work.

A road map for the completion of each requested task is to be developed and provided to the PM

Deliverable: All technical support must be documented in the Monthly Letter Status Report. At a minimum the documentation must include who requested the technical support, what was requested and the outcome of the technical support.

Estimated completion date: 12 months

5.0 DELIVERABLES AND/OR MILESTONES SCHEDULE

Task Number	Deliverable/Milestone Description	Due Date
1	*Develop List of Benchmark Calculations*	2 months from day of award
2	Benchmark Analysis	5 months from day of award
3	Documentation	12 months after project start (draft 10 months after project start)
4	Technical Support	Agreement Expiration

6.0 TECHNICAL AND OTHER SPECIAL QUALIFICATIONS REQUIRED

ORNL shall commit the appropriate number of qualified staff to the project. NRC reserves the right to approve the Project Manager and the individual personnel assigned to this task. The project manager and assigned staff shall be experienced with SCALE and in particular, code development with regard to cross section generation, and the peculiarities that are inherent with the code system.

Steve Bowman will be the Project Manager and Matt Jessee will be the Principal Investigator for this work. He will be supported by Will Wieselquist and Ugur Mertyurek. Resumes are on file.

7.0 ESTIMATED LABOR CATEGORIES AND LEVELS OF EFFORT

Intentionally left blank.

8.0 MEETINGS AND TRAVEL

No foreign or domestic travel is expected.

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

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).

9.0 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.

Please note that all deliverables are to provide for a 3 week NRC review period and include all input decks generated or used to complete the task, and where possible to be appropriately annotated for legibility. All submissions are to be provided in WORD and PDF format

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/Division of Contracts 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; job code 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 can also be found in Attachment 1.

10.0 PERIOD OF PERFORMANCE

Refer to block 7 on the IAA Award Form.

11.0 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: Don R. Algama
Agency: U.S. Nuclear Regulatory Commission
Office: RES
Mail Stop: CSB-03A7M
Washington, DC 20555-0001
E-Mail: don.algama@nrc.gov
Phone: 301.251.7940

Alternate Contracting Officer's Representative

Name: Dr. Mourad Aissa
Agency: U.S. Nuclear Regulatory Commission
Office: RES
Mail Stop: CSB-03A7M
Washington, DC 20555-0001
E-Mail: Mourad.Aissa@nrc.gov
Phone: 301.251.7511

12.0 MATERIALS REQUIRED

N/A

13.0 NRC-FURNISHED PROPERTY/MATERIALS

N/A

14.0 RESEARCH QUALITY

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.

15.0 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.

16.0 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