

INTERAGENCY AGREEMENT		1. IAA NO. NRC-HQ-60-17-T-0014/M0004			PAGE OF 1 2	
2. ORDER NO.		3. REQUISITION NO. RES-19-0019		4. SOLICITATION NO.		
5. EFFECTIVE DATE 12/20/2018		6. AWARD DATE 12/20/2018		7. PERIOD OF PERFORMANCE 09/11/2017 TO 12/31/2019		
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 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 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-8E06M WASHINGTON DC 20555-0001				13. LEGISLATIVE AUTHORITY Energy Reorganization Act of 1974		
				14. PROJECT ID		
				15. PROJECT TITLE FULL-CORE LWR CODE ASSESSMENT WITH SCALE/PARCS		
16. ACCOUNTING DATA 2019-X0200-FEEBASED-60-60D003-1145-11-6-174-253D-11-6-174-1145						
17. ITEM NO.	18. SUPPLIES/SERVICES	19. QUANTITY	20. UNIT	21. UNIT PRICE	22. AMOUNT	
	Project entitled, "Full-Core LWR Code Assessment with SCALE/PARCS." Master IAA: NRCHQ6014D0005 SUMMARY OF CHANGES: The purpose of this modification is to: (1) increase the level of effort and authorized ceiling by \$85,000.00 and (2) provide incremental funding in the amount of \$75,000.00; Accordingly, this task order is modified as follows: Continued ...					
23. PAYMENT PROVISIONS				24. TOTAL AMOUNT \$75,000.00		
25a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (SERVICING)				26a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (REQUESTING) 		
25b. NAME AND TITLE		25c. DATE		26b. CONTRACTING OFFICER SANDRA R. NESMITH		26c. DATE 1/15/19

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. 4.

2. The new authorized ceiling is \$565,000.00

3. Incremental funding in the amount of \$75,000.00 is provided, thereby increasing the total obligations for this task order from \$420,338.06 to \$495,338.06.

All other terms and conditions remain unchanged.

Attachment: Statement of Work, Mod. 4

ORNL PI: Brian Ade

NRC COR: Don Algama

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

Change Item 00001 to read as follows (amount shown is the obligated amount):

00001

Authorized Cost Ceiling
Total Obligated Amount: \$565,000.00
Incrementally Funded Amount: \$495,338.06

75,000.00

**COVER PAGE ADDENDUM TO:
 STATEMENT OF WORK (SOW)**

NRC Agreement Number NRC-HQ-60-14-D-0005	NRC Agreement Modification Number 	NRC Task Order Number (If Applicable) NRC-HQ-60-17-T-0014	NRC Task Order Modification Number (If Applicable) 4
Project Title Full-core LWR Code Assessment with SCALE/PARCS			
Job Code Number 	B&R Number 	Servicing Agency ORNL	
NRC Requisitioning Office RES/DSA/FSCB		Period of Performance 09/11/17 – 12/31/19	
NRC Form 187, Contract Security and Classification Requirements <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not Applicable		<input type="checkbox"/> Involves Proprietary Information <input type="checkbox"/> Involves Sensitive Unclassified	
<input checked="" type="checkbox"/> Non Fee-Recoverable		<input type="checkbox"/> 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	



CONTRACTING OFFICER'S REPRESENTATIVE

Contracting Officer's Representative

Name: Don R. Algama
Agency: U.S. Nuclear Regulatory Commission
Office: RES
Mail Stop: TWFN 10B07
Washington, DC 20555-0001
E-Mail: don.algama@nrc.gov
Phone: 301.415.1940

Alternate Contracting Officer's Representative

Name: Dr. Mourad Aissa
Agency: U.S. Nuclear Regulatory Commission
Office: RES
Mail Stop:
Washington, DC 20555-0001
E-Mail:
Phone:

GOVERNMENT-FURNISHED PROPERTY (GFP)

There is no Government Furnished Property anticipated for this work.

--- End of Executive Summary ---

DESCRIPTION/SPECIFICATIONS/WORK STATEMENT

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 allows for independent review of licensee submittals and accurate investigations of reactor and fuel phenomena important to nuclear safety.

The Polaris lattice physics computer codes in SCALE affects all licensing evaluations that are being performed at the NRC that rely on independent light water reactor (LWR) core analysis confirmatory calculations with PARCS. Accurate confirmatory analysis core simulations are required for LWR user needs, such as MELLLA+, and developing radionuclide data for analyses with MELCOR and MACCS2.

Technical Context:

The purpose of this task is to extend the lattice physics code assessment to assess the accuracy of Polaris/PARCS core modeling calculations. Full-core calculations will be performed with SCALE/GENPMAXS/PARCS and CE Monte Carlo reference models to assess the accuracy of predictions of core-level quantities of interest through code-to-code comparisons and comparisons to plant data. Data sets to consider include Watts Bar Unit 1, BEAVRS, Cofrentes, Tihange, and potentially Forsmark data or IRSN EDF data.

This work will assess the accuracy of coupled SCALE/PARCS analysis to understand bias and trends at the core level. The assessment should provide insight to prioritize code development efforts to minimize biases and improve accuracy

2.0 OBJECTIVE

The purpose of this project will be to assess the prediction accuracy of full core neutronics simulations with SCALE lattice physics codes and PARCS nodal code simulation.

3.0 SCOPE OF WORK/TASKS

The ORNL must provide all resources necessary to accomplish the tasks and deliverables described in this Statement of Work (SOW).

Task 1. FC LWR Lattice-Physics and Simulator Analysis with U/Q

The main task for this project will be to extend the recent SCALE lattice physics code assessment to assess the accuracy of Polaris/PARCS core modeling calculations. Full-core calculations should be performed with Polaris/PARCS with CE Monte Carlo reference models to assess the accuracy of predictions of core-level quantities of interest through code-to-code comparisons and comparisons to plant data. Data sets to consider will be prioritized by NRC staff, but may include the WBN1 Cycle 1 and 2 CASL benchmarks, the BEAVRS benchmark, the Cofrentes data for previous work on core validation, the publicly available Tihange benchmark, and potentially Forsmark data or IRSN EDF data. The comparison analysis should examine trends and biases in quantities of interest across the benchmark set to identify potential areas of improvement. Full-core uncertainty calculations with Sampler and Polaris/PARCS should be performed for selected benchmarks to quantify the uncertainty in key quantities of interest

Expected Level of Effort: 1905 hours

Task 2. Technical Support

Technical support and assistance in support of Task 1 of this task order and the operation of the SCALE system shall be provided to NRC staff identified by the NRC COR. For example assistance with technical issues as arisen from the above Task and may include interaction with ACRS, may be required. It is expected that some of the work required for this task may involve collaborations with other contractors/staff/etc as appropriate.

Expected Level of Effort: 235 hours

4.0 LIST OF DELIVERABLES

Computer code development must conform NEUR/BR-0167 requirements for Software Quality Assurance.

Task Number	Deliverable and Acceptance Criteria	Deliverable Format	Due Date
1	This report should be a NUREG/CR. NUREG/CR should include detailed technical designs (LWRs), a detailed summary of assessments and why they were chosen, and all input decks in an easily understood	Technical letter report in WORD and PDF. SCALE input files that can be run on	12 months from project initiation

	manner -from a the view point of posterity- that can be rerun on local machines.	independent systems	
2	As appropriate a technical letter report (TLR) that includes details of the actions undertaken in the performance of the task, description of any new features, input decks, etc. It should be provided in both WORD and PDF format.	Technical letter report in WORD and PDF.	12 months from project initiation

5.0 ESTIMATED LABOR CATEGORIES, KEY PERSONNEL AND LEVELS OF EFFORT

5.1 Labor Categories, Requirements and Key Personnel. 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 lattice physics and core analysis, and the peculiarities that are inherent with the code system

5.2 Level-of-Effort (in hours). Estimate the number of hours required for each labor category, including base and option periods. This estimate is advisory only and not to be considered as the sole basis for development of a staffing plan.

Expected levels of effort for each task are found in the SOW description in Section

6.0 CERTIFICATION AND LICENSE REQUIREMENTS

n/a

7.0 MEETINGS AND TRAVEL

No travel is expected.

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

ORNL personnel will be authorized travel expenses consistent with the Federal Travel Regulation (FTR) and the limitation of funds specified for the travel within this agreement/order.

Foreign travel for the [servicing agency or DOE Laboratory] personnel requires a 60-day lead time for NRC approval. For prior approval of foreign travel, the servicing agency must submit to the COR 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/>. All foreign travel requires prior written approval from the NRC Executive Director for Operations (EDO).

8.0 REPORTING REQUIREMENTS

The ORNL is responsible for structuring the deliverables to current agency standards. ORNL must submit deliverables free of spelling and grammatical errors and shall conform to requirements stated in this section.

8.1 Monthly Letter Status Report (MLSR)

ORNL must provide a Monthly Letter Status Report which consists of a technical progress report and financial status report. This report will be used by the sponsoring agency to assess the adequacy of the resources utilized by the servicing agency to accomplish the work contained in this SOW and to provide status of the servicing agency progress in achieving tasks and producing deliverables. The report shall include agreement/order summary information, work completed during the specified period, milestone schedule information, problem identification and resolution, travel plans, and staff hour summary. Copies must be sent to the COR and AMD at 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.

At a minimum, state that a final report summarizing the work performed and the results and conclusions derived shall be submitted to the COR. Indicate the number of report copies required, when the reports are due (i.e., days after agreement/order award or a given calendar date), and any content and format requirements.

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 the NRC's [preferred] MSLR template.

9.0 REQUIRED MATERIALS, FACILITIES, HARDWARE/SOFTWARE

n/a

10.0 APPLICABLE PUBLICATIONS (CURRENT EDITIONS)

n/a

11.0 DATA RIGHTS

The NRC shall have unlimited rights to and ownership of all deliverables provided under this agreement/order, including reports, recommendations, briefings, work plans and all other deliverables. All documents and materials, to include the source codes of any software, produced under this agreement/order are the property of the NRC with all rights and privileges of ownership/copyright belonging exclusively to the NRC. These documents and materials may not be used or sold by the servicing agency without prior written authorization from the CO. All materials supplied to the NRC shall be the sole property of the NRC and may not be used for any other purpose. This right does not abrogate any other Government rights.