INTERAGENCY AGREEMENT	1. IAA NO. NRC-HQ-20-14-T-0043	PAGE 1 OF 11

2. ORDER NO.	3. REQUISITION NO. NRR-14-0263	4. SOLICITATION NO

5. EFFECTIVE DATE	6. AWARD DATE	7. PERIOD OF PERFORMANCE
08/14/2014	08/14/2014	09/10/2014 TO 09/09/2015

8. SERVICING AGENCY
PACIFIC NORTHWEST NAT LAB
ALC:
DUNS: +4:
US DEPARTMENT OF ENERGY
PACIFIC NORTHWEST SITE OFFICE
PO BOX 350 MS K9-42
RICHLAND WA 99352

POC Genice Madera
TELEPHONE NO 509-372-4010

9. DELIVER TO
ANDREW PROFFITT
11555 ROCKVILLE PIKE
ROCKVILLE MD 20852

10. REQUESTING AGENCY
ACQUISITION MANAGEMENT DIVISION
ALC: 3100001
DUNS: 040535809 +4:
US NUCLEAR REGULATORY COMMISSION
ONE WHITE FLINT NORTH
11555 ROCKVILLE PIKE
ROCKVILLE MD 20852-2738

POC Andrew Proffitt
TELEPHONE NO. 301-415-1418

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 3WFN-05-C64MP
WASHINGTON DC 20555-0001

13. LEGISLATIVE AUTHORITY
Energy Reorganization Act of 1974

14. PROJECT ID

15. PROJECT TITLE
GUIDANCE FOR FUEL SEISMIC/LOCA DESIGN ANALYSIS

16. ACCOUNTING DATA
2014-X0200-FEEBASED-20-20D008-11-4-151-1065-251D

17 ITEM NO	18. SUPPLIES/SERVICES	19 QUANTITY	20. UNIT	21. UNIT PRICE	22. AMOUNT
	Guidance for Fuel Seismic/LOCA Design Analytical Methods. The Department of Energy Pacific Northwest National Laboratory shall provide technical assitance in accordance with the task order statement of work. Master IAA: NRCHQ2514D0001				
00001	Guidance for Fuel Seismic/LOCA Design Analytical Methods Total Obligated Amount$121,863.00 Incrementally Funded Amount: $50,000.00				121,863.00
	Continued ...				

23. PAYMENT PROVISIONS	24. TOTAL AMOUNT
	$50,000.00

25a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (SERVICING)		26a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (REQUESTING)	
25b. NAME AND TITLE	**25c. DATE**	**26b. CONTRACTING OFFICER**	**26c. DATE**
		JERRY PURCELL	9/03/14

SUNSI REVIEW COMPLETE SEP 22 2014

TEMPLATE - ADM001

ADM002

The total amount of award: $121,863.00. 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-25-14-D-0001			

Project Title		
Guidance for Fuel Seismic/LOCA Design Analytical Methods		
Job Code Number	**B&R Number**	**DOE Laboratory**
	11-4-149	PNNL
NRC Requisitioning Office		
NRR – Division of Safety Systems		

NRC Form 187, Contract Security and Classification Requirements ☐ Applicable ☒ Not 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

NUREG-0800, Standard Review Plan (SRP), Chapter 4.2, "Fuel System Design," Appendix A, "Evaluation of Fuel Assembly Structural Response to Externally Applied Forces," provides guidance for the review of fuel assembly structural design requirements with respect to applied loads during seismic events and loss-of-coolant accident (LOCA). During several recent fuel design reviews for advanced reactor designs (e.g., AREVA EPR, MHI APWR), the staff identified portions of SRP4.2 Appendix A which were inaccurate or lacking sufficient detail. In addition, analytical models and methods used by the fuel vendors were evolving including the introduction of new fuel assembly testing procedures and analytical credits (e.g., hydrodynamic damping).

2.0 OBJECTIVE

The objective of this task order is to obtain technical assistance from PNNL to assist the NRC staff in capturing knowledge gained and lessons learned from recent fuel seismic design reviews and revising the guidance in SRP4.2 Appendix A.

3.0 SCOPE OF WORK

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

PNNL Laboratory must provide the staff personnel to prepare a thorough technical evaluation report that captures knowledge gained and lessons learned from the recent reviews of advanced reactor fuel assembly designs.

4.0 SPECIFIC TASKS

PNNL must perform the following tasks:

Task 1 Prepare Draft Technical Evaluation Report

Capture knowledge gained and lessons learned during the review of recent advanced reactor fuel assembly designs. Specifically, describe aspects of an acceptable fuel seismic/LOCA analytical model along with underlying experimental database. Address each of the topics below. Prepare a technical letter report.

- Temperature effects on measured hydraulic (static and dynamic) damping force
- Flow velocity effects on measured hydraulic (dynamic) damping force
- Methods to combine axial flow and structural damping
- Irradiation effects on assembly stiffness (including grid spring relaxation)
- Temperature effects on assembly stiffness
- Overall in-service effects on predicted impact loads
- PROS and CONS of different test procedures (e.g., pluck versus shaker)
- Best-practice FEA analytical models for fuel rods, guide tubes, and assemblies including representative diagrams
- Mixed core factors (e.g., grid strap height, stiffness)
- Horizontal acceleration and impact on assembly components
- Vertical acceleration and impact on PWR assembly springs and BWR assembly lift-off
- Predicted stress/strain on tie rods or other unique features
- Linear/nonlinear models and response range
- Applicability of old NUREGs - NUREG/CR-1018, NUREG/CR-1019
- Model validation and verification
- Deformation range of grids and effect on modeling/calculated results- Zero permanent deformation, negligible deformation, dimension tolerance deformation, crush limit deformation, Post crush limit deformation
- Establishing impact force limits (acceptance limit) and how this effects modeling
- Quantifying and applying uncertainties in models and experimental data
- Examples when an increase in model sophistication is necessary (linear to nonlinear bundle, elastic to inelastic grid impact model)
- Effect of frequency and amplitude assumptions on model damping results (guide tube strain and grid impact forces).
- Acceptable methods and models for determining guide tube or channel box deformation

Task 2 Public Meeting

Prepare for and travel to NRC HQ to participate in a public meeting with fuel vendors and stake holders. Prepare a trip report.

Task 3 Prepare Final Technical Evaluation Report

Review and evaluate any additional information from the meeting or follow-up from the meeting and

prepare a technical evaluation report.

a. Draft

b. Incorporate NRC comments and prepare a final TER

5.0 DELIVERABLES AND/OR MILESTONES SCHEDULE

The schedule for project deliverables is shown in the following table.

Deliverable Number	Deliverable and Acceptance Criteria	Deliverable Due Date
1	For Task 1, Technical Letter Report Acceptance Criteria: Report must have the required content and follow the required format	NLT 12 weeks after award of task order
2	For Task 2, Trip Report Acceptance Criteria: Report must have the required content and follow the required format	NLT 1 week after the trip
3	For Task 3.a., Draft Technical Evaluation Report Acceptance Criteria: Report must have the required content and follow the required format	NLT 2 weeks after the meeting or 2 weeks after receipt of additional information
4	For Task 3.b., Final Technical Evaluation Report Acceptance Criteria: Report must have the required content, follow the required format, and incorporated NRC comments	NLT 2 weeks after receipt of NRC comments

All deliverables shall include the following identifying information:

Agreement No.
Task Order No.
JCN No.
TAC No.
Licensee
Site

PNNL must provide all reports as draft products. The COR will review all draft deliverables (and coordinate any internal NRC staff review, if needed) and provide comments back to the laboratory. PNNL must revise the draft deliverables based on the comments provided by the COR, and then deliver the final version of the deliverable. When mutually agreed upon between PNNL and the COR, PNNL may submit preliminary or partial drafts to help gauge PNNL's understanding of the particular work requirement.

The above deliverables shall be provided electronically and in hard copy (upon request) to the Contracting Officer (CO) and COR. See Section 9.0 of this SOW for information on distribution of the MLSR.

The COR will acknowledge receipt of deliverables by e-mail.

6.0 TECHNICAL AND OTHER SPECIAL QUALIFICATIONS REQUIRED

One **Key Staff** on an intermittent, part-time basis with strong background in fuel assembly structural design, finite element analysis, and direct knowledge of recent advanced reactor fuel design reviews.

PNNL shall provide a project manager to oversee the effort and ensure the timely submittal of accurate and complete deliverables.

The NRC will rely on representation made by PNNL concerning the qualifications of the personnel assigned to this task order, including assurance that all information contained in the technical and cost proposals, including resumes, is accurate and truthful. The resume for each professional proposed to work under this task order (principal investigators, technical staff, employees, consultants, specialists or subcontractors) shall describe the individual's experience in applying his or her area of engineering specialization to work in the proposed area. The use of particular personnel on this task order is subject to the COR and CO approval. This includes any proposed changes to key personnel during the life of the task order.

7.0 ESTIMATED LABOR CATEGORIES AND LEVELS OF EFFORT (OPTIONAL SECTION)

The estimated level of effort in professional staff hours apportioned among the tasks by labor category is as shown in the table below The estimate is advisory only and not to be considered as the sole basis for development of a staffing plan.

Task Number	Labor Category	Estimated Labor Hours FY 2014	Estimated Labor Hours FY 2015	Total
1	Key Staff	100	200	300
	Project Manager	10	20	30
2	Key Staff	0	40	40
	Project Manager	0	4	4
3	Key Staff	0	120	120
	Project Manager	0	12	12
	Total	110	396	506

8.0 MEETINGS AND TRAVEL

Optional: One one-person, four-day trip to NRC Headquarters.

All travel requires written approval from 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

PNNL is responsible for structuring the deliverables to follow agency standards. The current agency standard software for developing documents is Microsoft Office Suite 2010, including Word 2010 for text documents (.docx) and Excel 2010 for spreadsheets (.xlsx). The current agency Portable Document Format (.pdf) standard is Adobe Acrobat X Pro. Deliverables shall be submitted free of spelling and grammatical errors and conform to requirements stated in this SOW.

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," PNNL shall electronically submit a MLSR by the 20th day of each month to the following:

COR

CO

Acquisition Management Division at ContractsPOT.Resource@nrc.gov

Jeremy.Dean@nrc.gov
Andrew.Proffitt@nrc.gov
Paul.Clifford@nrc.gov
RidsNrrDss.Resource@nrc.gov

If a project is a task ordering agreement, separate MLSRs shall 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 content and format of the MLSR shall be consistent with Attachment 5 (Monthly Letter Report Instructions) to the base ordering agreement SOW.

10.0 PERIOD OF PERFORMANCE

The estimated period of performance for this work is 12 months from the authorization of work.

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: J. Andrew Proffitt
Agency: U.S. Nuclear Regulatory Commission
Office: NRR/DSS/SNPB
Mail Stop: O10-B03
Washington, DC 20555-0001
E-Mail: andrew.proffitt@nrc.gov
Phone: 301-415-1418

Alternate Contracting Officer's Representative

Name: Mathew Panicker
Agency: U.S. Nuclear Regulatory Commission
Office: NRR/DSS/SNPB
Mail Stop: O10-B03
Washington, DC 20555-0001
E-Mail: mathew.panicker@nrc.gov
Phone: 301-415-2987

12.0 MATERIALS REQUIRED

N/A

13.0 NRC-FURNISHED PROPERTY/MATERIALS

Advanced reactor fuel design topical reports along with PNNL TERs already available to PNNL staff.

NOTE: These documents contain proprietary information and must be safeguarded against unauthorized disclosure. After completion of work, the documents should either be destroyed or returned to NRC. If they are destroyed, please confirm this in an E-mail to the Technical Monitor with a copy to the Project Officer and include the date and manner in which the documents were destroyed.

14.0 RESEARCH QUALITY

N/A

15.0 STANDARDS FOR CONTRACTORS WHO PREPARE NUREG-SERIES MANUSCRIPTS

N/A

16.0 OTHER CONSIDERATIONS

References

N/A

Access to Non-NRC Facilities/Equipment
N/A

Applicable Publications

10 CFR 50 Appendix A;
10 CFR 50.46;
SRP Section 4.2

Controls over document handling and non-disclosure of materials

N/A