

<b>INTERAGENCY AGREEMENT</b>		1. IAA NO. NRC-HQ-60-13-D-0010/M0009		PAGE 1 OF 2	
2. ORDER NO.		3. REQUISITION NO. RES-16-0106		4. SOLICITATION NO.	
5. EFFECTIVE DATE 03/31/2016		6. AWARD DATE 03/31/2016		7. PERIOD OF PERFORMANCE 04/01/2013 TO 03/30/2018	
8. SERVING AGENCY IDAHO NATL ENG ENV LAB ALC: DUNS: 048105530 +4: US DEPARTMENT OF ENERGY IDAHO OPERATIONS OFFICE 1955 FREMONT AVENUE IDAHO FALL ID 83415-1222  POC LAURIE PETERSON, MS: 1240 TELEPHONE NO. 208-526-5909		9. DELIVER TO MICHELLE GONZALEZ US NUCLEAR REGULATORY COMMISSION MAIL STOP T10-E6 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. DOWNS OFFICE US NUCLEAR REGULATORY COMMISSION ONE WHITE FLINT NORTH 11555 ROCKVILLE PIKE MAILSTOP 03-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 V6414			
		15. PROJECT TITLE NEW REACTOR SPAR MODEL WORK			
16. ACCOUNTING DATA 2016-X0200-FEEBASED-60-60D002-17-6-161-1061-253D					
17. ITEM NO.	18. SUPPLIES/SERVICES	19. QUANTITY	20. UNIT	21. UNIT PRICE	22. AMOUNT
	Project Title: New Reactors All Hazard SPAR Models Master IAA: N/A The purpose of this modification is to add additional within scope task 6 entitled "development of AP1000 plant specific SPAR models" and associated subtasks thereby (1) increase the authorized cost ceiling by \$897,260.00 from \$507,994.00 to \$1,405,254.00, (2) provide incremental funding in the amount of \$100,000.00 from \$507,994.00 to \$607,994.00 and (3) extend the period of performance from 03/31/2016 to 03/30/2018. Accordingly the Continued ...				
23. PAYMENT PROVISIONS		24. TOTAL AMOUNT \$100,000.00			
25a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (SERVING)		25b. SIGNATURE OF GOVERNMENT REPRESENTATIVE (REQUESTING)			
26a. NAME AND TITLE Jeffrey C. Fogg, Contracting Officer		26c. DATE 3/6/16		26b. NAME AND TITLE JEFFREY R. MITCHELL	
				26c. DATE 3/31/2016	

SUNSI REVIEW COMPLETE

TEMPLATE - ADM001

APR 12 2016

ADM002

MAND NRC-HQ-60-13-D-0010/M0009	ORDER NO	PAGE 2	OF 2
<p>Agreement is modified as follows:</p> <p>Refer to the Statement of Work under Modification No. 6 is hereby deleted in its entirety and replaced with the Statement of Work Revision No. 4 attached to this Modification No. 9.</p> <p>The new Authorized Cost Ceiling is \$1,405,254.00.</p> <p>This modification provides incremental funding in the amount of \$100,000.00, thereby increasing the total obligations for this Agreement from \$507,944.00 to \$607,944.00.</p> <p>Attachment No. 1: Statement of Work Rev 4</p> <p>All other terms and conditions remain unchanged.</p> <p>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.</p>			

## STATEMENT OF WORK

### REVISION NO. 4

<b>NRC Agreement Number</b>  NRC-HQ-60-13-D-0010	<b>NRC Agreement Modification Number</b>  	<b>NRC Task Order Number (If Applicable)</b>  	<b>NRC Task Order Modification Number (If Applicable)</b>  
<b>Project Title</b>  New Reactors All Hazards SPAR Model			
<b>Job Code Number</b>  V6414	<b>B&amp;R Number</b>  60176161	<b>DOE Laboratory</b>  Idaho National Laboratory	
<b>NRC Requisitioning Office</b>  Office of Nuclear Regulatory Research			
<b>NRC Form 187, Contract Security and Classification Requirements</b> <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Note 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)	
<b>Docket Number (If Fee-Recoverable/Applicable)</b>  		<b>Inspection Report Number (If Fee Recoverable/Applicable)</b>  	
<b>Technical Assignment Control Number (If Fee-Recoverable/Applicable)</b>  		<b>Technical Assignment Control Number Description (If Fee-Recoverable/Applicable)</b>  	

### 1.0 BACKGROUND

This project is in support of NRO User Need "Development of Standardized Plant Analysis Risk Models for New Reactors", dated March 25, 2008, (ML080870180), RES User Need Number: NRO-2008-002. Prior to new plant operation, the NRC staff may need to perform risk assessments to confirm probabilistic (PRA) results provided in combined license (COL) submittals or to evaluate risk-informed applications after COL issuance. The industry has indicated that additional risk-informed applications (e.g., 10 CFR 50.69, T/S) may be submitted after COL issuance.

Once the plants begin operation, the results from licensee PRAs or independent assessments using SPAR models may be used by the NRC staff for the evaluation of operational findings and events similar to the assessments performed for current operating reactors. Since the SPAR models are based (as much as possible) on standardized assumptions and data, they can also be used to compare the effects of design differences.

## **2.0 OBJECTIVE**

The main objective of this work is to develop a design-specific all hazards SPAR model for the Vogtle AP1000 reactor design, as specified by the project manager, based on the SAPHIRE software, version 8. As part of the SPAR model development, the requisite supporting documentation will also be included in the deliverable to NRO. Since design standardization is a key aspect of the new plants, this external event model will be based on the existing AP1000 IE SPAR model. Additional external events modules (i.e, internal fire, LPSD, seismic) could be included on this project as requested by the project manager.

## **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).

INL shall complete all hazards modelling for the existing AP1000 SPAR model as instructed by the COR.

## **4.0 SPECIFIC TASKS**

The DOE Laboratory must perform the following tasks:

### **Task 1 Development of SPAR-FLI Model for the AP1000 design (Vogtle)**

#### **1.1 Develop an internal flooding (FLI) model for the Vogtle AP1000 Design**

Using the documented PRA provided by the vendor, construct a FLI model for Vogtle AP1000 reactor design starting with the AP1000 internal events SPAR Model. The model shall be developed to the same standardization criteria of the existing models, to the extent practicable. This includes model construct, event nomenclature, assumptions, preferred technical positions and other key aspects of the existing models to allow NRC staff the ease of use of the model.

The modeling activities shall be done in accordance with the SPAR –AHZ Model Maker's Guidance.

#### **1.2 Perform quality control and quality assurance reviews**

#### **1.3 Compare results of the FLI model to results provided by vendor**

Compare the results of the new SPAR model to the results provided by the vendor, using methods developed for the previous model comparisons.

#### **1.4 Document the FLI model and the comparison of the results.**

Document the FLI model in the same format used for the existing SPAR model, to the extent practicable. Include in this documentation the results of the comparison between the SPAR model and the results provided by the vendor.

## **Task 2 Development of SPAR Internal Fire Model for the AP1000 design (Vogtle)**

### **2.1 Develop an internal fire (FRI) model for the Vogtle AP1000 Design**

Using the documented PRA provided by the vendor, construct a FRI model for Vogtle AP1000 reactor design starting with the AP1000 internal events SPAR Model. The model shall be developed to the same standardization criteria of the existing models, to the extent practicable. This includes model construct, event nomenclature, assumptions, preferred technical positions and other key aspects of the existing models to allow NRC staff the ease of use of the model.

The modelling activities shall be done in accordance with the SPAR –AHZ Model Maker's Guidance and Volume 2 of the RASP Handbook.

### **2.2 Perform quality control and quality assurance reviews**

### **2.3 Compare results of the FRI model to results provided by vendor**

Compare the results of the new SPAR model to the results provided by the vendor, using methods developed for the previous model comparisons.

### **2.4 Document the FRI model and the comparison of the results.**

Document the FRI model in the same format used for the existing SPAR model, to the extent practicable. Include in this documentation the results of the comparison between the SPAR model and the results provided by the vendor.

## **Task 3 Development of low power shutdown model for the AP1000 design (Vogtle)**

### **3.1 Develop a low power shutdown (LPSD) model for the Vogtle AP1000 Design**

Using the documented PRA provided by the vendor, construct a LPSD model for Vogtle AP1000 reactor design starting with the AP1000 internal events SPAR Model. The model shall be developed to the same standardization criteria of the existing models, to the extent practicable. This includes model construct, event nomenclature, assumptions, preferred technical positions and other key aspects of the existing models to allow NRC staff the ease of use of the model.

The modeling activities shall be done in accordance with the SPAR –AHZ Model Maker's Guidance and Volume 2 of the RASP Handbook.

### **3.2 Perform quality control and quality assurance reviews**

### **3.3 Compare results of the LPSD model to results provided by vendor**

Compare the results of the new SPAR model to the results provided by the vendor, using methods developed for the previous model comparisons.

### **3.4 Document the LPSD model and the comparison of the results.**

Document the LPSD model in the same format used for the existing SPAR model, to the extent practicable. Include in this documentation the results of the comparison between the SPAR model and the results provided by the vendor.

#### **Task 4 Provide Support to Other New Reactors SPAR Models**

- 4.1 Review and finalize ABWR LPSD model, EPR SPAR model and AP1000 Internal Flooding SPAR Models.
- 4.2 Perform model maintenance and updates of the SPAR models as requested by the by the project manager<sup>1</sup>.
- 4.3 Develop other new reactors SPAR models (i.e internal events, all hazards) as requested by the project manager.

#### **Task 5 Development of Level 2 (L2) PRA SPAR Model for the AP1000 design (Vogtle)**

- 5.1 Develop a Level 2 model for the Vogtle AP1000 Design

Using the documented PRA provided by the vendor, construct an L2 model for Vogtle AP1000 reactor design starting with the AP1000 internal events SPAR Model. The model shall be developed to the same standardization criteria of the existing models, to the extent practicable. This includes model construct, event nomenclature, assumptions, preferred technical positions and other key aspects of the existing models to allow NRC staff the ease of use of the model.

The modeling activities shall be done in accordance with the SPAR –AHZ Model Maker's Guidance.

- 5.2 Perform quality control and quality assurance reviews
- 5.3 Compare results of the FLI model to results provided by vendor

Compare the results of the new SPAR model to the results provided by the vendor, using methods developed for the previous model comparisons.

- 5.4 Document the L2 model and the comparison of the results.

Document the FLI model in the same format used for the existing SPAR model, to the extent practicable. Include in this documentation the results of the comparison between the SPAR model and the results provided by the vendor.

#### **Task 6 Development of AP1000 plant specific SPAR models**

- 6.1 **Develop internal events plant specific SPAR models (AP1000 design) as instructed by the COR**

Using the documented PRA provided by the specific utility, construct an internal events SPAR models starting with the AP1000 internal events SPAR Model. The model shall be developed to the same standardization criteria of the existing models, to the extent practicable. This includes model construct, event nomenclature, assumptions, preferred technical positions and other key aspects of the existing models to allow NRC staff the ease of use of the model.

- 6.2 **Develop AHZ plant specific SPAR models (AP1000 design) as instructed by the COR**

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<sup>1</sup> For the purpose of this contract, the COR is equivalent to the project manager (PM).

Using the AP1000 AHZ model and the documented PRA provided by the utility, construct an AHZ SPAR model. The model shall include internal flooding, internal fire and seismic modelling.

The model shall be developed to the same standardization criteria of the existing models, to the extent practicable. This includes model construct, event nomenclature, assumptions, preferred technical positions and other key aspects of the existing models to allow NRC staff the ease of use of the model.

The modelling activities shall be done in accordance with the SPAR –AHZ Model Maker's Guidance and Volume 2 of the RASP Handbook.

### **6.3 Develop plant specific LPSD models (AP1000 design) as instructed by the COR**

Using the documented PRA provided by the vendor and the AP1000 LPSD model, construct a LPSD model design starting with the AP1000 VC plant specific internal events SPAR Model. The model shall be developed to the same standardization criteria of the existing models, to the extent practicable. This includes model construct, event nomenclature, assumptions, preferred technical positions and other key aspects of the existing models to allow NRC staff the ease of use of the model.

The modeling activities shall be done in accordance with the SPAR –AHZ Model Maker's Guidance and Volume 2 of the RASP Handbook.

### **6.4 Develop Level 2 plant specific SPAR model (AP1000 design) as instructed by the COR**

Using the documented PRA provided by the vendor, construct an L2 model for VC Summer AP1000 reactor design starting with the AP1000 plant specific internal events SPAR Model. The model shall be developed to the same standardization criteria of the existing models, to the extent practicable. This includes model construct, event nomenclature, assumptions, preferred technical positions and other key aspects of the existing models to allow NRC staff the ease of use of the model.

The modeling activities shall be done in accordance with the SPAR –AHZ Model Maker's Guidance.

### **6.5 Perform quality control and quality assurance reviews**

### **6.6 Compare results of the SPAR model to results provided by the utility.**

Compare the results of the new SPAR model to the results provided by the utility, using methods developed for the previous model comparisons.

### **6.7 Document the internal events model and the comparison of the results.**

Document the model in the same format used for the existing SPAR model, to the extent practicable. Include in this documentation the results of the comparison between the SPAR model and the results provided by the vendor.

## **5.0 DELIVERABLES AND/OR MILESTONES SCHEDULE**

Task #		Milestone (months after project start)	Final Deliverables (months after project start)	Additional Comments
1		6 months Draft FLI SPAR Model	3 months after NRO's review- Final FLI SPAR Model	Document the AP1000 FLI Model and the comparison to the vendor's results (cut-set level)
2		6 months Draft FRI SPAR Model	3 months after NRO's review- Final FRI SPAR Model	Document the AP1000 FRI Model and the comparison to the vendor's results (cut-set level)
3		6 months Draft LPSD SPAR Model	3 months after NRO's review- Final LPSD SPAR Model	Document the AP1000 LPSD Model and the comparison to the vendor's results (cut-set level)
4			2 months after modification	Provide final models for ABWR LPSD, EPR and AP1000 Internal Flooding models
5		6 months Draft L2 SPAR Model	3 months after NRO's review- Final L2 SPAR Model	Document the AP1000 L2 Model and the comparison to the vendor's results (cut-set level)
6	6.1	3 months after site visit	At most, deliver 2 plant Specific AP1000 SPAR Models  March 30, 2018	Document plant specific IE, AHZ, LPSD and Level 2 SPAR Models and the comparison to the utility's results (cut-set level).  Specific deadlines and models to be developed will be discussed and instructed by the COR as plant specific PRA information becomes available for benchmarking.
	6.2	6 months after site visit		
	6.3	9 months after site visit		
	6.4	12 months after site visit		
	6.5- 6.7	N/A		

## 6.0 TECHNICAL AND OTHER SPECIAL QUALIFICATIONS REQUIRED

This activity requires PRA Analysts and Senior PRA Analysts who have a very strong technical background in PRA, intimate experience with SPAR models, and who are knowledgeable from a global standpoint of standardization which is crucial to the needs of the staff who use the models. Additionally, this activity requires a special understanding of how these modelling issues affect PRA quality. Site access will not be required to perform this activity.

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



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## **8.0 MEETINGS AND TRAVEL**

Travel associated with this SOW is expected to be minimal, since attendance at most meetings will be via teleconference or video teleconference. A total of three (4) 1 person trips have been budgeted in anticipation of travel required in support of the work as described above. It is anticipated that one INL Staff will attend each meeting and that each meeting typically lasts three days.

The laboratory may suggest or propose addition, deletion, or substitution of meetings and/or trips. For planning and budgeting purposes, potential meeting places are NRC Headquarters, Rockville, MD

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**

As stated in the Scope of Work, the deliverables for this project consist of the following:

Document the SPAR model in the same format used for the existing SPAR model, to the extent practicable. Include in this documentation the results of the comparison between the SPAR model and the results provided by the vendor. Documentation shall be provided as an electronic manuscript, in Adobe® Portable Document Format. The Contractor shall prepare the text in Microsoft Word, and use any of the file types allowed for preparation of NUREG-SERIES MANUSCRIPTS (see below). Paper documents are not required.

Interim and final reports shall be provided in Adobe Acrobat Portable Document Format (PDF). Distribution of the interim reports shall be controlled by the PM/TM.

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 20<sup>th</sup> 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](mailto: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

Michelle. M Gonzalez  
Mail Stop C4A07M  
Washington, D. C. 20555-0001  
Phone: (301) 251-7591  
Fax: (301) 251-7424  
Email: (michelle.gonzalez@nrc.gov)

### Alternate Contracting Officer's Representative

Peter Appignani  
Agency: U.S. Nuclear Regulatory Commission  
Mail Stop C4A07M  
Washington, D. C. 20555-0001  
Phone: (301) 251-7608  
Fax: (301) 251-7424  
Email: (peter.appignani@nrc.gov)

## **12.0 MATERIALS REQUIRED**

N/A

### **13.0 NRC-FURNISHED PROPERTY/MATERIALS**

Information to be provided by NRC:

NRC will provide to INL the documented PRA and other associated documents provided to the NRC by the NSSS Vendor sufficient to develop the SPAR model.

### **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**

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