

INTERAGENCY AGREEMENT		1. IAA NO. NRC-HQ-60-17-T-0007			PAGE OF 1 10	
2. ORDER NO.		3. REQUISITION NO. RES-17-0110		4. SOLICITATION NO.		
5. EFFECTIVE DATE See Block 26c		6. AWARD DATE 07/19/2017		7. PERIOD OF PERFORMANCE 07/01/2017 TO 05/31/2022		
8. SERVICING AGENCY ENERGY IDAHO OPERATIONS OFFICE UNITED STATES DEPT OF ALC: DUNS: 048105530 +4: 1955 FREMONT AVE IDAHO FALLS ID 834021510 POC Laurie Acosta TELEPHONE NO. 208-526-5909				9. DELIVER TO JEFFERY WOOD 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 TASK 7-SAPHIRE ALGORITHM ENHANCEMENTS (T.O. UNDER		
16. ACCOUNTING DATA 2017-C0200-FEEBASED-60-60D002-60B205-1052-11-6-213-251D-11-6-213-1052						
17. ITEM NO.	18. SUPPLIES/SERVICES		19. QUANTITY	20. UNIT	21. UNIT PRICE	22. AMOUNT
	INL Contract No. DE-AC07-051D14517 Task Ordering Agreement No.: NRC-HQ-60-17-D-0005 Task Order No.: NRC-HQ-60-17-T-0007 Title: Task 7 SAPHIRE Algorithm Enhancements The NRC and Idaho National Laboratory (INL) hereby enter into this Agreement for the task order entitled "Task 7 SAPHIRE Algorithm Enhancements." Continued ...					
23. PAYMENT PROVISIONS				24. TOTAL AMOUNT \$225,000.00		
25a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (SERVICING)				25a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (REQUESTING) 		
25b. NAME AND TITLE		25c. DATE	26b. CONTRACTING OFFICER MORIE E. GUNTER-HENDERSON		26c. DATE 7/19/2017	

Period of Performance: July 1, 2017 - May 31, 2022

Consideration and Obligations:

(a) Authorized Cost Ceiling \$2,041,635.00

(b) The amount presently obligated with respect to this DOE Agreement is \$225,000.00. 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 document is hereby made a part of this Agreement:

Attachment: Statement of Work

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.

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.

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

Continued ...

INL PM: Michael Calley
Michael.Calley@inl.gov
(208) 526-9230

INL PI: James Knudsen
James.Knudsen@inl.gov
(208) 526-6432

NRC COR: Jeffery Wood
Jeffery.Wood@nrc.gov
(301) 415-0953

DUNS: 040535809 TAS: 31X0200.320
ALC: 31000001
Master IAA: NRCHQ6017D0005

00001

Task Order Award
Line Item Ceiling: \$2,041,635.00
Incrementally Funded Amount: \$225,000.00

2,041,635.00

The total amount of award: \$2,041,635.00. The obligation for this award is shown in box 24.

STATEMENT OF WORK

PROJECT TITLE: Task 7 SAPHIRE Algorithm Enhancements

AGREEMENT NO: NRC-HQ-60-17-D-0005
TASK ORDER NO: NRC-HQ-60-17-T-0007

LABORATORY: Idaho National Laboratory (INL)

NRC REQUISITION OFFICE: Office of Nuclear Regulatory Research

NRC CONTRACTING OFFICER REPRESENTATIVE (COR):
NAME: Jeffery J. Wood
PHONE: 301-415-0953
Email: Jeffery.Wood@nrc.gov

1. BACKGROUND

SAPHIRE (Systems Analysis Programs for Hands-on Integrated Reliability Evaluations) is a computer code used by the U.S. Nuclear Regulatory Commission (NRC) for building and running probabilistic risk assessment (PRA) models. The Idaho National Laboratory (INL) developed SAPHIRE under contract to the NRC. SAPHIRE has evolved into a state-of-the-art software package with applications in several risk-informed regulatory activities.

This project will enhance the SAPHIRE features and capabilities available to users. The work will include tasks to continue the development of features that were initially studied under past projects, such as JCN V6040, "Evaluate Methods to Improve SAPHIRE 8 Speed and Performance," JCN V6080, "Advanced PRA Quantification Methods for SAPHIRE and SPAR," and JCN V6368, "SAPHIRE Algorithm Enhancements." This project will involve advancement of those prior efforts beyond the work that was completed in the past. The project will also involve the addition of new and enhanced features and capabilities to SAPHIRE. INL also has ongoing work related to the maintenance and quality assurance of SAPHIRE under NRC agreement number NRC-HQ-60-15-D-0010, "SAPHIRE 8 Code Maintenance and Quality Assurance Activities." This project will not duplicate work of past projects and the ongoing work under NRC-HQ-60-15-D-0010.

2. OBJECTIVE

The objectives of this project are to enhance the features and capabilities of the SAPHIRE software. The enhancements will improve the software's ability to solve PRA models accurately, efficiently, and with advanced user interface capabilities.

3. TECHNICAL AND OTHER SPECIAL QUALIFICATIONS REQUIRED

Experienced computer programmers (Modula-2, Delphi, and SAGE), are needed to modify the SAPHIRE software. Programmer familiarity with NRC SAPHIRE applications and SPAR model program would also be beneficial for developing and implementing advanced PRA methods.

4. SCOPE OF WORK

The project involves making modifications to the SAPHIRE software. All work involving modifications to SAPHIRE shall be done in accordance to established SAPHIRE software quality assurance (SQA) practices as outlined in NRC-HQ-60-15-D-0010, "SAPHIRE 8 Code Maintenance and Quality Assurance Activities," and the related SAPHIRE SQA documentation. The modifications described in the tasks below are intended to be incorporated into a version (or versions) of SAPHIRE that will be released for general use by SAPHIRE Users Group members. INL shall seek approval from the NRC Contracting Officer Representative (COR) before releasing any revised version of SAPHIRE for general use by the SAPHIRE Users Group.

Subtask 1: Provide Plan for SAPHIRE Enhancements

INL shall create a plan for implementing enhancements to SAPHIRE. The plan shall include descriptions of each specific enhancement that may be implemented in SAPHIRE. INL shall not proceed with implementing the enhancements outlined in the plan prior to obtaining COR written approval of the plan. INL shall provide quarterly updates to the plan to include new enhancements as suggested by the COR. The plan updates shall also include a summary of the enhancements that have been completed.

Deliverable/Completion: Plan for implementing enhancements to SAPHIRE during FY2017 and FY2018 – August 15, 2017

 Plan for implementing enhancements to SAPHIRE during FY2019 – September 30, 2018

 Plan for implementing enhancements to SAPHIRE during FY2020 – September 30, 2019

 Plan for implementing enhancements to SAPHIRE during FY2021 – September 30, 2020

 Plan for implementing enhancements to SAPHIRE during FY2022 – September 30, 2021

Subtask 2: Implement SAPHIRE Algorithm Enhancements and Provide Final Report

This task involves implementing enhancements to SAPHIRE to support improved capabilities for performing model analyses and documenting results. At the direction of the COR, INL shall incorporate enhancements to the quantification and analysis capabilities of SAPHIRE. These enhancements shall be implemented to address emerging needs of the SAPHIRE users. SAPHIRE enhancements may include:

- Improved capabilities in reporting and documenting analysis results,
- Enhancements to support new SPAR model features (e.g., support system initiator, Level 2, common-cause failure modeling),
- Support to improve SPAR model maintenance and update capabilities,
- Changes to accommodate large and complex models,
- Enhancements to support SAPHIRE users' abilities to collaborate on projects and share analysis results,
- Development of tools to allow users to run SAPHIRE analyses through a web browser interface.

- Improvements to SAPHIRE’s parallel processing and distributed solving (i.e., solving that is distributed over a system of networked computers) capabilities,
- Expansion of SAPHIRE’s binary decision diagram solving capabilities, or other quantification and analysis enhancements to improve quantification accuracy and/or speed.

INL shall provide a design specification document for each enhancement upon the request of the COR. INL shall provide a final letter report describing the enhancements that have been implemented in SAPHIRE under this task.

Deliverable/Completion: Interim letter report describing implementation of SAPHIRE enhancements – June 30, 2018

Interim letter report describing implementation of SAPHIRE enhancements – June 30, 2019

Interim letter report describing implementation of SAPHIRE enhancements – June 30, 2020

Interim letter report describing implementation of SAPHIRE enhancements – June 30, 2021

Final letter report describing implementation of SAPHIRE enhancements – June 30, 2022

5. DELIVERABLES/SCHEDULES AND/OR MILESTONES

Deliverables and their due dates are summarized in the table below.

Sub task	Deliverable	Due Date
1	Plan for implementing enhancements to SAPHIRE during FY2017 and FY2018	August 15, 2017
2	Interim letter report describing implementation of SAPHIRE enhancements	June 30, 2018
1	Plan for implementing enhancements to SAPHIRE during FY2019	September 30, 2018
2	Interim letter report describing implementation of SAPHIRE enhancements	June 30, 2019
1	Plan for implementing enhancements to SAPHIRE during FY2020	September 30, 2019
2	Interim letter report describing implementation of SAPHIRE enhancements	June 30, 2020
1	Plan for implementing enhancements to SAPHIRE during FY2021	September 30, 2020
2	Interim letter report describing implementation of SAPHIRE enhancements	June 30, 2021
1	Plan for implementing enhancements to SAPHIRE during FY2022	September 30, 2021
2	Final letter report describing implementation of SAPHIRE enhancements	June 30, 2022

6. REPORTING REQUIREMENTS

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

6.1. MONTHLY LETTER STATUS REPORTS

INL must provide a Monthly Letter Status Report by the 15th of the month 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 following:

RESDRAMLSR.Resource@nrc.gov
Jeffery.Wood@nrc.gov
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 the NRC's [preferred] MSLR template.

7. MEETINGS AND TRAVEL

None

8. NRC-FURNISHED MATERIAL

No NRC-furnished material, other than what is available in ADAMS, is required.

9. 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 contractor to ensure that these quality criteria are adequately addressed throughout the course of the research that is performed. The NRC project manager and technical monitor will review all research products with these criteria in mind.

10. NEW 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.

All format guidance, as specified in NUREG-0650, Revision 2, 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.

11. SUBCONTRACTING/CONSULTANT INFORMATION

Describe any technical support effort that is proposed to be performed by a subcontractor or consultant. Identify the level of effort, by task, of any proposed subcontractor or consultant and provide an explanation of the need for subcontracting that portion of the effort. Note that “pass through” contracting is not allowed under the requirements of the DOE/NRC Memorandum of Understanding. For the purposes of this effort, a “pass through” contract is generally defined as subcontracting 50 percent or more of the technical effort. For any subcontract or consultant effort, describe the following:

- the necessity of subcontracting,
- the tasks and subtasks the subcontractor or consultant will perform,
- the level of effort proposed for the subcontract effort,
- the status and expected time frame for selection, and
- the method of selection of the subcontractor or consultant.

12. INFORMATION TECHNOLOGY (IT) RESOURCES:

When IT resources are proposed by a DOE Laboratory that are not specifically identified in the Statement of Work, the need for and cost of those resources must be justified. Exhibit 8 of MD 11.7 can be used to help determine justification. Proposed IT resources should be those

required to accomplish the work, but which are not available from within the laboratory's inventory of IT resources. Common office automation equipment and software, i.e., personal computers, word processing and spreadsheet software, and printers, should not routinely be proposed as they should normally be provided as part of the laboratory's information processing infrastructure. Whenever IT resources are proposed, justification is necessary for the NRC to be able to evaluate the requirements and to approve their acquisition.

In addition to the total cost of IT resources to be reported on the NRC Form 189, the following justification is to be included in the proposal:

1. IT Resource Requirements. List as line items each IT resource (hardware, e.g., laptop computer, engineering workstation; software - by product name; and services, e.g., computer time, database services) proposed for acquisition and estimate the cost of each item by fiscal year. Funding should be indicated for the year in which the IT resources are needed. Provide totals for all items for each fiscal year which match the costs listed on the line labeled IT RESOURCES on the NRC Form 189. Any IT acquisition shall conform to the acquisition and reporting requirements identified in NRC Management Directive 11.7, Part 9.
2. Justification. For each required IT resource with an acquisition cost of \$500 or more, or group of resources, e.g., a system, provide specifications or the specific make/model, and other acquisition and reporting requirements identified in NRC Management Directive 11.7, Part 9. Briefly discuss how the IT resources will be used, including information about workload to be processed, required capacities, throughput, transfer rates, compatibility and expandability requirements, or any other information that supports the need to acquire the specific resources being proposed.

13. CONTRACTING OFFICER REPRESENTATIVE

Technical direction as defined in Section 1 of the Standard Terms and Conditions will be provided by the Project Manager (Jeffery Wood), who can be reached at:

U. S. Nuclear Regulatory Commission
Mail Stop: T10 A12
Washington, DC 20555-0001
Phone: 301-415-0953
Email: Jeffery.Wood@nrc.gov

Express mail should be sent to:
U. S. Nuclear Regulatory Commission
Mail Stop: T10 A12
11545 Rockville Pike
Rockville, MD 20852-2738