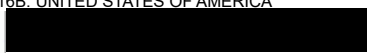


AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE		PAGE OF PAGES	
						1 10	
2. AMENDMENT/MODIFICATION NO.		3. EFFECTIVE DATE		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. (If applicable)	
P00001		See Block 16C		NRR-20-0005		EWC	
6. ISSUED BY		CODE		7. ADMINISTERED BY (If other than Item 6)		CODE	
US NRC - HQ		NRCHQ					
ACQUISITION MANAGEMENT DIVISION							
MAIL STOP TWFN-07B20M							
WASHINGTON DC 20555-0001							
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)				(x)			
SOUTHWEST RESEARCH INSTITUTE							
6220 CULEBRA RD				9A. AMENDMENT OF SOLICITATION NO.			
SAN ANTONIO TX 782385166				9B. DATED (SEE ITEM 11)			
				x			
				10A. MODIFICATION OF CONTRACT/ORDER NO.			
				31310018D0002			
				31310019F0045			
				10B. DATED (SEE ITEM 13)			
CODE 007936842		FACILITY CODE					
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS							
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended. <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required) Net Increase: \$30,000.00 2020-X0200-FEEBASED-20-20D007-1034-11-4-149-252A-11-4-149-1034							
13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
CHECK ONE	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.						
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).						
X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: Mutual Agreement of the Parties; FAR 43.103(a) Bilateral Modification						
	D. OTHER (Specify type of modification and authority)						
E. IMPORTANT: Contractor <input type="checkbox"/> is not. <input checked="" type="checkbox"/> is required to sign this document and return <u>1</u> copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) Please see Page 2 for modification language to increase the task order ceiling, providing incremental funding, revise the price/cost schedule, extend the period of performance, and revise the Statement of Work. Task Order Ceiling: \$120,410.00 (changed) Task Order Total Obligation Amount: \$109,940.00 (changed) Period of Performance: 06/21/2019 to 04/30/2020							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
				JENNIFER A. DUDEK			
				TEL: 301-415-2257 EMAIL: Jennifer.Dudek@nrc.gov			
15B. CONTRACTOR/OFFEROR		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA		16C. DATE SIGNED	
(Signature of person authorized to sign)						11/12/2019	
				(Signature of Contracting Officer)			

NSN 7540-01-152-8070
Previous edition unusable

STANDARD FORM 30 (REV. 10-83)
Prescribed by GSA
FAR (48 CFR) 53.243

Except as provided herein, all terms and conditions of the document referenced in Item 9 A or 10A, as heretofore changed, remains unchanged and in full force and effect.

The purpose of this task order modification is to: 1) increase the task order ceiling by \$40,470.00 from \$79,940.00 to \$120,410.00; 2) provide incremental funding in the amount of \$30,000.00, thereby increasing the funding from \$79,940.00 to \$109,940.00; 3) revise the price/cost schedule; 4) extend the period of performance through April 30, 2020; and 5) revise the Statement of Work to add Task 3. Accordingly, the task order is hereby modified as follows:

1) Section **B.2 CONSIDERATION AND OBLIGATION— TASK ORDERS (AUG 2011)** is deleted in its entirety and replaced with the following:

“(a) The total ceiling of this contract for the products/services under this contract is **\$120,410.00 (Cost of [REDACTED] and Fixed-Fee of [REDACTED])**.

(b) This order is subject to the minimum and maximum ordering requirements set forth in the contract.

(c) The amount presently obligated with respect to this order is **\$109,940.00** of which [REDACTED] represents Costs and [REDACTED] represents Fixed-Fee. The obligated amount shall, at no time, exceed the order ceiling as specified in paragraph (a) above. When and if the amount(s) paid and payable to the Contractor hereunder shall equal the obligated amount, the Contractor shall not be obligated to continue performance of the work unless and until the Contracting Officer shall increase the amount obligated with respect to this order, in accordance with FAR Part 43 - Modifications. Any work undertaken by the Contractor in excess of the obligated amount specified above is done so at the Contractor's sole risk and may not be reimbursed by the Government.

(d) The Contractor shall comply with the provisions of FAR 52.232-22 - Limitation of Funds, for incrementally-funded delivery orders or task orders.

(e) In accordance with FAR 52.216-8 - Fixed Fee, it is the policy of the NRC to withhold payment of fee after payment of 85 percent of the fee has been paid in order to protect the Government's interest. The amount of fixed-fee withheld from the contractor will not exceed 15 percent of the total fee or \$100,000, whichever is less. Accordingly, the maximum amount of fixed-fee that may be held in reserve is [REDACTED].

2) Section **B.3 PRICE/COST SCHEDULE** is deleted in its entirety and replaced with the following:

“Total Estimated Cost and Fixed-Fee breakdown by CLIN is presented below.

CLIN	Description	Est Cost	Fixed Fee	Total Cost Plus Fixed Fee
0001	Estimated Cost	[REDACTED]	[REDACTED]	[REDACTED]
0002	Fee	[REDACTED]	[REDACTED]	[REDACTED]
TOTAL				\$120,410.00

Total Estimated Cost and Fixed-Fee breakdown by cost element is presented below.

SECTION C – Descriptions/Specifications/Statement of Work

C.1 PROJECT TITLE

Technical Assistance in Support of the Review of the NRC Office of Nuclear Regulatory Research Technical Reports Related to the Fire Probabilistic Risk Assessment Methods

C.2 BACKGROUND

With the adoption of the risk-informed, performance-based fire protection rule 10CFR50.48(c), decisions and their technical bases are relying to a much greater extent on fire Probabilistic Risk Assessments (PRAs). In particular, those plants that already have transitioned to this alternative rule developed or are maintaining fire PRAs to estimate the plants' fire risk.

The NRC in collaboration with the Electric Power Research Institute (EPRI) initially published the technical guidance and framework for developing fire PRA models in NUREG/CR-6850 (EPRI 1011989), "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," which was based on a limited amount of experimental data, supplemented by expert judgment. In an effort to update this guidance, the Office of Nuclear Reactor Regulation (NRR) has worked with the Office of Nuclear Regulatory Research (RES) and EPRI to perform additional research and experiments in order to produce supplemental guidance related to certain phenomenological and practical limitations of the existing guidance. Specifically, the NRC and EPRI have drafted two reports intended to advance the state of knowledge with regard to crediting personnel suppression, obstructed radiation, fire spread between adjacent electrical enclosures, motor and transformer fires, wall and corner effects, main control board fire scenarios and probability of non-suppression floor values.

The following two reports are to be reviewed and comments developed under this task order:

Report No. 1: NUREG-2230, *Methodology for Modeling Fire Growth and Suppression Response for Electrical Cabinet Fires in Nuclear Power Plants*

Over the past decade, modern fire probabilistic risk assessments (PRAs) have been developed using NUREG/CR-6850 (also EPRI 1011989). The results show that fire can be a significant portion of the overall site risk profile, however, the methodology was never fully piloted before implementation. As a result, additional research and development in the methods and data has been performed over the past decade to refine the estimates of risk and close technical gaps in the methodology. One aspect of the fire PRA methods and data that has not been explicitly reanalyzed is the fire growth profile and plant personnel suppression response for electrical cabinets. A simplified model of the average time to peak, steady state and decay are used to model the ignition source's heat release rate profile. For manual suppression credit, a dense collection of electrical ignition sources spanning three decades is used to represent the fire brigade and plant suppression response.

Recent research efforts focused on obtaining more detailed information regarding the fire incidents at nuclear power plants. This data collection has enabled researchers to obtain more details on the fire attributes, timeline and plant impact. This project specifically reviewed the available electrical cabinet fire incident data in an effort to update the methodology to better reflect the observed operating experience. Insights from the data review served as the basis for

amending portions of the fire modeling and suppression response to more accurately align with operating experience.

The outcome of this work is a revised set of parameters that address both the fire growth and the suppression response in the context of fire scenario modeling. The set of electrical cabinet fire events were classified into either a growing or interruptible fire categorization. Interruptible fires are those that have observed ignition, but no significant growth for a period of time. Growing fires, on the other hand, experience growth immediately after ignition. Furthermore, the non-suppression event tree has been updated to better allow for early plant suppression actions. Additional manual non-suppression bins have been added to reflect the scenario characteristics. The results of this research may be implemented in new and existing fire PRAs for a more realistic representation of the scenario progression and suppression end states.

Report No. 2: NUREG-2178 Draft, *Refining and Characterizing Heat Release Rate from Electrical Enclosures During Fire (RACHELLE-FIRE)- Volume 2: Fire Modeling guidance for Electrical Cabinets, Electric Motors, Indoor Dry Transformers and the Main Control Board*

NUREG-2178 Volume 1 refined the heat release rates (HRRs) associated with electrical cabinets and introduced an obstructed fire plume model for refining the vertical zone of influence (ZOI). As a result, Volume 1 has been implemented in a number of nuclear power plant (NPP) fire probabilistic risk assessments (PRAs) to obtain a more realistic estimate of risk associated with electrical cabinet fires. While the methodology in Volume 1 is focused on data analysis and the ZOI, it was realized that modeling refinements associated with other aspects of cabinet fires and the location of fires should be investigated. These targeted areas are further investigated in this report.

This report describes improved methods that may increase the realism in the modeling of selected ignition sources. The areas further investigated include the treatment of flame radiation and obstructed radiation, fire propagation between adjacent electrical cabinets, HRRs for electric motors and dry transformers, fire location factor, non-suppression probability floor values and the modeling of the main control board.

BACKGROUND AND NEED FOR THE MODIFICATION

The report of new Task 3, Report No. 3: "NUREG-2233 Draft, Methodology for Modeling Transient Fires in Nuclear Power Plant Fire Probabilistic Risk Assessments," is yet another report which falls under the effort to maintain fire PRAs to estimate a plant's fire risk. This report was not available at the time the task order was developed and authorized and, at the time, there was no clear expectation as to when Report NO. 3 would be available. The scope of work for the review of this report is the same as the other two reports.

The methods and data provided in NUREG/CR-6850 Volume II and NUREG/CR-6850 Supplement 1 resulted from an extensive effort to gather together the knowledge and best practices at that time for modeling fires in FPRAs. In some cases, the level of knowledge was not as mature as needed for supporting realism in FPRAs. For example, the aggregate results of multiple FPRAs showed that transient fires were consequential and high contributors to plant risk which is a conclusion not wholly supported by operating experience. As a result, the FPRAs developed contained oversimplifications and assumptions that lean in the conservative direction. Over the years, the industry and the NRC have worked to develop methods and data that are more realistic and representative of the operating experience with respect to fire. This report develops improved fire modeling methods that will improve the realism of modeling transient fires

in FPRAs.

This report provides new probabilistic distributions and detailed fire modeling input parameters for the modeling of transient fires in FPRAs. Distributions of ZOI enable the easy screening of targets without the need to separately calculate a ZOI via fire modeling. Detailed fire model input parameters on the fuel properties and fire growth and decay profiles can be used as direct replacement for values used in existing detailed fire models in current FPRAs. This new set of model input data replaces the more limited set of data contained in NUREG/CR-6850 and NUREG/CR-6850 Supplement 1.

C.3 OBJECTIVE

The objective of this task order is to obtain technical assistance from the Southwest Research Institute's (SwRI's) Center for Nuclear Waste Regulatory Analyses (CNWRA) to assist the staff in assessing the rationality, accuracy, soundness, completeness, and comprehensiveness of the results of the research which is described in the draft reports.

To accomplish this overall objective, several tasks are outlined in Section C.4.

C.4 SCOPE OF WORK

The CNWRA will review and develop comments on the above draft reports for NRC staff consideration; feedback on the comments will be provided by the NRC. This task order also includes assistance in reviewing RES comment dispositions and assisting in the resolution of open items. The CNWRA will provide technical letter reports containing the comments.

The Contractor shall perform the following tasks:

Tasks

Completion Schedule

1. Review of draft NUREG-2230

a. Review report and consider the following attributes in the report:

- The basis and validity of the underlying premise of crediting personnel suppression in a more realistic manner.
- The concept of interruptible fires vs. fires that progress beyond a point where the growth potential can be interrupted and suppressed before damage occurs.
- The event tree logic for crediting the suppression of interruptible fires vs. growth fires.

Prepare a technical letter report documenting comments and recommendations.

b. Review responses to the comments (disposition of comments) and identify those issues that have been resolved and those for which further discussion may be needed along with the basis for

Four weeks after work authorization, issued by technical direction of the COR.

Two weeks after receipt of NRC comments.

resolution. Prepare a technical letter report¹.

2. Review of draft NUREG-2178, Volume 2

a. Review report and consider the following attributes in the report:

Four weeks after receipt of the report.

- The basis and validity of the underlying concepts for obstructed radiation, realistic fire spread from one electrical enclosure to another, heat release rates for motors and transformers, improved fire location factors, improved non-suppression probability floor values, and improved methodology for modeling main control board fire scenarios.
- Whether the revised methods represent technically valid and defensible approaches for modeling fire damage.
- Consistency of the referenced heat soak method with NRC-approved versions.
- Potential assumptions or limitations that might be warranted.
- The validity of the event tree logic used to resolve some of the report subjects.

Prepare a technical letter report documenting comments and recommendations.

b. Review RES responses to the comments (disposition of comments) and identify those issues that have been resolved and those for which further discussion may be needed along with the basis for resolution. Prepare a technical letter report².

Two weeks after receipt of NRC comments.

3. Review of draft NUREG-2233

a. Review report and consider the following attributes in the report:

Four weeks after receipt of the report.

- The appropriateness of the fire test data used to develop the methodology.
- The validity of the process used to develop the revised distributions.
- Whether the revised methods represent technically valid and

¹ There may be more than one round of comments and it is assumed that there is sufficient level of effort to accommodate the additional round(s).

² There may be more than one round of comments and it is assumed that there is sufficient level of effort to accommodate the additional round(s).

defensible approaches for modeling fire damage.

- Potential assumptions or limitations that might be warranted.

- b. Review RES responses to the comments (disposition of comments) and identify those issues that have been resolved and those for which further discussion may be needed along with the basis for resolution. Prepare a technical letter report³.

Two weeks after receipt of NRC comments.

C.5 APPLICABLE DOCUMENTS AND STANDARDS

The documents are the two reports referenced herein.

C.6 DELIVERABLES AND DELIVERY SCHEDULE

See Section C.4 above for the delivery schedule.

Technical Reporting Requirements

1. At the completion of each Subtask 1.a, 2.a and 3.a., submit a technical letter report which contains the results and findings from the review associated with the attributes listed under each Subtask and the basis for those findings. Describe any other highlights and observations along with the basis for those observations.
2. At the completion of each Subtask 1.b, 2.b and 3.b., submit a technical letter report which contains an evaluation of the RES comments and the recommendation as to whether the issue has been properly addressed or resolved, or not. Provide a list of those issues for which further discussion is needed and the basis for the issue.

Monthly Letter Status Reporting (MLSR) Requirements

Copies of the MLSRs are to be sent to the COR the Alternate COR with copies provided to the Contracting Officer and to Mehdi.Reisifard@nrc.gov.

Each month, the contractor will provide a Monthly Letter Status Report (MLSR) per Section F.2 of the Base Contract. This report is due no later than the 20th calendar day of the following month and will be provided in PDF format. If no work was performed during the prior month, the contractor shall not prepare and submit an MLSR. The MLSR shall be provided electronically to the COR and the contracting officer.

C.7 REQUIRED LABOR CATEGORIES

One Principal Investigator (PI)/Senior Engineer who possesses expertise and working knowledge and experience in the areas of (1) nuclear power plant fire protection; (2) fire testing; and (3) the application of fire PRA methodologies and reactor PRA results.

³ There may be more than one round of comments and it is assumed that there is sufficient level of effort to accommodate the additional round(s).

One staff-level Fire Protection Engineer Nuclear Engineer who possesses in-depth knowledge of U.S. nuclear power plant systems and operations.

C.8 GOVERNMENT-FURNISHED PROPERTY

The report for Task 1 will be provided by the COR upon authorization of work by the Contracting Officer.

The report for Task 2 is expected in the fall 2019 and will be provided to the Principle Investigator upon release by the Office of RES.

The report for Task 3 will be provided to the Principle Investigator shortly after authorization of the modification.

No other property is anticipated to be needed.

C.9 PLACE OF PERFORMANCE

Work will be performed at Center for Nuclear Waste Regulatory Analyses (CNWRA) facilities, except for travel as identified in Section C.10.

C.10 CONTRACTOR MEETINGS/TRAVEL

Contractor participation in meetings for this task order are generally expected to be conducted remotely via teleconference; no travel is anticipated.

C.11 SECURITY

The work under this order will be at the UNCLASSIFIED level. This task order does not involve the contractor to access, possess, store or generate Sensitive Unclassified Information (SUNSI).

C.12 SPECIAL CONSIDERATIONS

Rights in Data

The contractor shall provide all data produced under this contract to the RC COR at the end of the contract. All data first produced in performance of this contract are subject to FAR clause 52.227-14, Rights in Data—General (Dec 2007), which is hereby incorporated by reference.

Technical Direction

The COR may issue Technical Direction (TD) throughout the duration of this task order. The TD must be within scope of the task order SOW and shall not constitute new assignments of work or changes of such a nature as to constitute a change to the task order cost or period of performance. Any modifications to the scope of work, cost, or period of performance of this task order must be issued by the Contractor Officer (CO) and will be coordinated with the COR. The COR may issue TD for the purpose of making adjustments or clarifications to the timing and performance of the tasks and/or the delivery schedule of the documents within this task order.

In the event that the contractor believes that any of the TDs have an impact in terms of changing the scope, cost or period of performance of the task order, prior to taking action on the TD in question, the contractor shall immediately inform the task order CO and request appropriate guidance prior to taking action on the TD in question.

Assumptions and Understandings

It is understood that the level of effort for Tasks 1, 2 and 3 contains sufficient effort to conduct telephone conference calls with the NRC staff. Such phone calls, for example, might be arranged by the NRC COR with the NRC RES staff to discuss the comments and to reach an understanding. Comments on RES draft reports might be provided to the contractor such that they may have to be resubmitted by the contractor.