

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

BPA NO _____ 1. CONTRACT ID CODE _____ PAGE 1 OF PAGES 2

2. AMENDMENT/MODIFICATION NO. M008 3. EFFECTIVE DATE See block 16c. 4. REQUISITION/PURCHASE REQ. NO. 04-07-077M008 5. PROJECT NO.(if applicable) _____
 FFS: RES-C09-526

6. ISSUED BY U.S. Nuclear Regulatory Commission CODE 3100 7. ADMINISTERED BY (if other than item 6) U.S. Nuclear Regulatory Commission CODE 3100
 Div. of Contracts
 Attn: Mr. Michael Mills
 Mail Stop TWB-01-B10M
 Washington, DC 20555
 Washington, DC 20555

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) BATTELLE MEMORIAL INSTITUTE
505 KING AVENUE
COLUMBUS OH 432012696
 CODE 007901598 FACILITY CODE _____

9A. AMENDMENT OF SOLICITATION NO. _____
 9B. DATED (SEE ITEM 11) _____
 10A. MODIFICATION OF CONTRACT/ORDER NO. GS23F0011L DR-04-07-077
 10B. DATED (SEE ITEM 13) 04-19-2007

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in item 14. The hour and date specified for receipt of Offers is extended, 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 ACKNOWLEDGMENT 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) B&R No. 9-60-15-111-127, Job Code: N6360, BOC: 252A
31X0200.960 Obligate: \$162,000

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

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 data, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.102(b).
 C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
 D. OTHER (Specify type of modification and authority) Mutual Agreement of the Parties

E. IMPORTANT: Contractor is not, is required to sign this document and return 2 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Refer to page 2 for a detailed description of this modification.

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

16A. NAME AND TITLE OF SIGNER (Type or print) Hannah S. Nunn
Contracting Officer
 16B. CONTRACTOR/OFFEROR Hannah S. Nunn
 (Signature of person authorized to sign) 15C. DATE SIGNED 7/1/09
 18A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Jeffrey L. McDermott
Contracting Officer
 18B. UNITED STATES OF AMERICA [Signature]
 BY (Signature of Contracting Officer) 18C. DATE SIGNED 7/1/09

NSN 7540-01-182-8070
 PREVIOUS EDITION NOT USABLE

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

TEMPLATE - ADM001

SUNSI REVIEW COMPLETE

JUL 2 2009

ADM002

Confirming the verbal authorization of \$24,300 provided to Battelle on 05/15/09, the purpose of this bilateral modification is to: (1) increase the estimated ceiling amount of this delivery order by \$162,505, from \$813,042 to \$975,547 (2) increase the obligated amount by \$162,000 from \$813,042 to \$975,042, and (3) incorporate the attached revised Statement of Work. Accordingly, the delivery order is hereby modified as follows:

Section A.2 Consideration and Obligation—Labor Hours Type Task Order is changed to read as follows:

"(a) The total estimated amount of this contract (ceiling) for the services ordered, delivered, and accepted under this contract is \$975,547.

(b) The amount presently obligated with respect to this contract is \$975,042. This obligated amount may be unilaterally increased from time to time by the Contracting Officer by written modification to this contract. The obligated amount shall, at no time, exceed the contract 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 contract. Any work undertaken by the Contractor in excess of the obligated amount specified above is done so at the Contractor's sole risk."

All other terms and conditions of the contract remain unchanged.

Previous Obligated Amount: \$813,042
Increased Amount: \$162,000
New Total Obligated Amount: \$975,042

New Ceiling Amount: \$975,547

WITHIN SCOPE CHANGE TO THE STATEMENT OF WORK
UNDER NRC PURCHASE ORDER NO. DR-04-07-077

TITLE: Evaluation of Leak-Before-Break Criteria

BACKGROUND

Recent operational experience of primary water stress corrosion cracking (PWSCC) in aging reactors has influenced the current tasking priorities and regulatory research needs from this program. To adequately address the ongoing regulatory needs and issues, certain tasks will be amended while others will be eliminated or the level of effort curtailed in this modification.

After a review of MRP 44 Part 1, the Nuclear Regulatory Commission (NRC) staff agreed in a June 2001 letter to the industry's Materials Reliability Program (MRP) that a low probability of near-term failure of welds exists and that pressurized water reactors (PWR) may continue to operate safely while the industry performs additional analyses and inspections. Since that time the issue of degradation mechanisms like PWSCC in leak-before-break (LBB) systems took a lower priority because of numerous safety significant materials degradation issues, i.e. control rod drive mechanism (CRDM) penetration cracking, Davis-Besse head corrosion, South Texas Unit 1 lower head penetration cracking, and pressurize heater sleeve cracking. As a follow-up, the MRP wrote the following reports related to the current LBB issues regarding dissimilar metal welds, weld overlays, and LBB inspection and evaluation guidelines:

1. MRP-113: "Alloy 82/182 Pipe Butt Weld Safety Assessment for U.S. PWR Plant Designs," July 2004.
2. MRP-140: "LBB Evaluation for PWR Alloy 82/182 Welds", April 2005.
3. MRP-139: "Primary System Piping Butt Weld Inspection and Evaluation Guidelines," July 2005.
4. MRP-169: "Technical Basis for Preemptive Weld Overlays for Alloy 82/182 Butt Welds in PWRs," October 2005.

The guidelines in MRP-139 were issued with "mandatory" implementation under the NEI 03-08, "Guidelines for the Management of Materials Initiatives." The purpose of these guidelines is to manage PWSCC through a combination of inspection and mitigation processes. These industry guidelines do not discriminate between welds approved by the NRC staff for LBB and other dissimilar metal butt welds. On August 5, 2005, UNR NRR 2005-011 entitled "User Need Request on Primary Water Stress Corrosion Cracking in Leak-Before-Break Systems" requested assistance from Office of Nuclear Regulatory Research (RES) to develop a position on the management of the PWSCC in LBB piping systems. Office of Nuclear Reactor Regulation (NRR) prioritized this research effort as high since the results of this work will be used to establish review criteria for future LBB applications involving Alloy 82/182/600 materials and to support any regulatory actions taken in connection with PWSCC in butt welds involving these materials.

OBJECTIVE

The objective of this project is to provide technical analytical support to NRC to develop the technical basis for future regulatory decisions related to quantify the susceptibility of primary pressure boundary butt welds to degradation, leakage, and rupture due to PWSCC and to

quantify the changes in operational risk that PWSCC susceptibility creates for pipe whip restraint exemptions.

SCOPE OF WORK

Amend and increase level of effort on existing task:

1. Amend Task 1: Evaluate Residual Stress Profiles of Representative Dissimilar Butt-Weld and Weld Overlay Configurations from the original statement of work to the following:

Task 1: Evaluate Residual Stress Profiles of Representative Dissimilar Butt-Weld and Weld Overlay Configurations

Validating predictive finite element models of complex welded structures has been achieved; however, dissimilar metal welds like the Alloy 82/182/600 butt weld and mitigated configurations typical in LBB applications are more complex and difficult to model. Task 1 focuses on benchmarking and validating the use of finite element modeling for complex weld geometries found in many LBB systems.

Subtask 1a) The contractor shall construct a finite element model to predict the residual stress profiles of EPRI's Phase I simple mockups and NRC's Phase II (International Round Robin and Weld Overlay) pressurizer dissimilar metal butt-weld mockups.

Subtask 1b) Provide technical assistance to the NRC staff for:

- Industry meetings, proposals, and conference calls
- Advisory Committee for Reactor Safeguards (ACRS)/NRC meetings - provide technical expertise to the NRC as necessary
- Review pertinent industry reports and guidelines related to the industry-proposed criteria for stress improvement processes.

Task 1 Deliverable Schedule:

- a. Provide a technical letter report detailing the finite element model results for the dissimilar metal butt-weld Minority Serving Institutions (MSIP) and full structural weld overlay (FWOL) mockups 3 months after receipt of input data package from the NRC program manager.
- b. Provide a technical letter report detailing the finite element model results for the dissimilar metal butt-weld residual stress validation mockups 3 months after receipt of input data package from the NRC program manager.

Estimated Increased Level of Effort: 1,058 hours from original SOW to 1,100 hours.

2. Amend Task 3: Assess material replacement through PWSCC-resistant Weld Overlays from the original statement of work to the following:

Replacement of materials with a more resistant alloy has already been used by industry as a means of corrective action for PWSCC. At V.C. Summer, the hot leg to reactor vessel weld and material on either side of the cracked weld were removed for destructive examination and an Alloy 690 spool piece was welded in place with Alloy 52/152. At TMI-1, a full structural weld overlay repair was applied to the hot-leg-to-surge line weld using Alloy 52. At a PWR in Sweden, an annulus of Alloy 182 weld material that encapsulated the PWSCC was removed and refilled or inlaid with Alloy 152 weld metal. Criteria need to be developed for evaluating the effectiveness of full structural and optimized weld overlays with resistant materials.

- Subtask 3a) Through a literature survey and review of analysis associated with other subtasks assess the effectiveness of full structural weld overlays and optimized weld overlays with PWSCC resistant materials, e.g. Alloy 52M.
- Subtask 3b) The contractor shall construct finite element models to predict the through-wall residual stress profile of the representative full structural and optimized weld overlay configurations. Plant specific full structural and optimized weld overlay configurations and design parameters will be provided by the NRC to evaluate specific licensee claims on the effectiveness of these full structural and optimized overlay techniques to mitigate PWSCC through stress reversal.
- Subtask 3c) Using the stress analysis results in subtask 3b and best guidance on crack growth rates, evaluate the behavior of likely undetected flaws with a variety of depths and sizes remaining after non-destructive examination.
- Subtask 3d) Provide Technical assistance to the NRC staff for:
 - NRC review of licensee submittals
 - Industry meetings, proposals, and conference calls
 - ACRS/NRC meetings - provide technical expertise to the NRC as necessary
 - Reviewing pertinent industry reports and guidelines related to the industry-proposed criteria for material replacement mitigation proposals and code cases.

Task 3 Deliverable Schedule:

- a. Provide a technical letter report addressing subtasks 3a-3d to be completed 18 months after the contract award date.
- b. The contractor should identify in the Monthly Letter Status Report (MLSR) and also in the technical letter reports any areas where it has been determined that information in addition to subtasks 3a-3d is needed.

Estimated Increased Level of Effort: 884 hours from original SOW to 1,062 hours.

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 PM and technical monitor will review all research products with these criteria in mind.

LEVEL OF EFFORT

Specifically, the increased level of effort for Task 1 is 0.02 additional Staff Years and Task 3 is 0.09 additional Staff Years.

REPORTING REQUIREMENTS

Monthly Letter Status Report.

A MLSR is to be submitted to the NRC Project Manager by the 20th of the month following the month to be reported with copies provided to the following:

RESDEMLSR.Resource@nrc.gov

The MLSR will identify the title of the project, the job code, the Principal Investigator, the period of performance, the reporting period, summarize each month's technical progress, list monthly spending, total spending to date, and the remaining funds and will contain information as directed in NRC Management Directive 11.1. Any administrative or technical difficulties which may affect the schedule or costs of the project shall be immediately brought to the attention of the NRC PM.

PUBLICATIONS NOTE

RES encourages the publication of the scientific results from RES sponsored programs in refereed scientific and engineering journals as appropriate. If the laboratory proposes to publish in the open literature or present the information at meeting in addition to submitting the required technical reports, approval of the proposed article or presentation should be obtained from the NRC PM. The RES Project Manager shall approve or unapproved the material as submitted, approve it subject to NRC suggested revisions, or disapprove it. In any event, the RES PM may disapprove or delay presentation or publication of papers on information that is subject to

Commission approval that has not been ruled upon or which has been disapproved. Additional information regarding the publication of NRC sponsored research is contained in NRC Management Directives 3.7, "NUREG Series Publications," and 3.9, "NRC Staff and Contractor Speeches, Papers, and Journal Articles on Regulatory and Technical Subjects."

If the presentation or paper is in addition to the required technical reports and the RES Project Manager determines that it will benefit the RES project, the Project Manager may authorize payment of travel and publishing costs, if any, from the project funds. If the Project Manager determines that the article or presentation would not benefit the RES project, the costs associated with the preparation, presentation, or publication will be borne by the contractor. For any publication or presentations falling into this category, the NRC reserves the right to require that such presentation or publication will not identify the NRC's sponsorship of the work.

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.

MEETINGS AND TRAVEL

Biweekly phone progress reports shall be conducted with the NRC Project Officer for approximately one-hour in duration throughout the period of performance. The frequency and duration of the phone progress reports will be adjusted according to the needs of the program to ensure progress is maintained.

Per NRC Project Officer request during the period of performance, four four-day trips for three people to Rockville, MD or NRC-designated location shall be budgeted to provide technical assistance to this program.

NRC-FURNISHED MATERIAL

None

TECHNICAL DIRECTION

Technical direction will be provided by the Project Manager, Aladar Csontos, who can be reached at:

U. S. Nuclear Regulatory Commission
ATTN: Aladar Csontos
Mail Stop: CS-05C07m
Washington, D. C. 20555-0001

Phone: (301) 251-7640
Fax: (301) 251-7420
Email: Aladar.Csontos@NRC.gov

Hand-Carried mail should be sent to:
U. S. Nuclear Regulatory Commission
ATTN: Aladar Csontos
Mail Stop: CS-05C07m
21 Church Street
Rockville, MD 20850