ORDER FOR SUPPLIES OR SERVICES

~~IMPORTANT: Mark all packages and papers with contract and/or order numbers.~~

BPA NO NRC-DR-04-08-145

1 DATE OF ORDER 10 | 1 | 2008

2. CONTRACT NO (If any) GS-23F0011L

3 ORDER NO MODIFICATION NO

4 REQUISITION/REFERENCE NO. 04-08-145

5 ISSUING OFFICE (Address correspondence to)
US NRC
Attn: Danielle Emche, 301-492 3625
Mail Stop: TWB-01-B10M

Washington DC 20555

6 SHIP TO.
a. NAME OF CONSIGNEE U.S. Nuclear Regulatory Commission
b. STREET ADDRESS Attn: Al Csontos
Mail Stop: T10 M5
c. CITY Washington d STATE DC e. ZIP CODE 20555

7 TO:
a NAME OF CONTRACTOR BATTELLE MEMORIAL INSTITUTE
b COMPANY NAME
c. STREET ADDRESS 902 BATTELLE BLVD
d. CITY RICHLAND e STATE WA f ZIP CODE 993541793

f SHIP VIA

8 TYPE OF ORDER
☐ a PURCHASE
REFERENCE YOUR _____
Please furnish the following on the terms and conditions specified on both sides of this order and on the attached sheet, if any, including delivery as indicated
☐ b. DELIVERY
Except for billing instructions on the reverse, this delivery order is subject to instructions contained on this side only of this form and is issued subject to the terms and conditions of the above-numbered contract.

9. ACCOUNTING AND APPROPRIATION DATA See CONTINUATION Page
NO FUNDS ARE OBLIGATED AT THIS TIME.

10 REQUISITIONING OFFICE RES

11 BUSINESS CLASSIFICATION (Check appropriate box(es))
☐ a SMALL ☒ b. OTHER THAN SMALL ☐ c. DISADVANTAGED ☐ g. SERVICE-DISABLED VETERAN-OWNED
☐ d. WOMEN-OWNED ☐ e HUBZone ☐ f. EMERGING SMALL BUSINESS

12. F.O.B POINT

13 PLACE OF
a INSPECTION DESTINATION
b. ACCEPTANCE DESTINATION

14 GOVERNMENT B/L NO

15 DELIVER TO F.O.B. POINT ON OR BEFORE (Date)

16 DISCOUNT TERMS

17 SCHEDULE (See reverse for Rejections)

ITEM NO (a)	SUPPLIES OR SERVICES (b)	QUANTITY ORDERED (c)	UNIT (d)	UNIT PRICE (e)	AMOUNT (f)	QUANTITY ACCEPTED (g)
	The contractor shall provide "Reactor Coolant Pressure Boundary Analyses" in accordance with the attached SOW (Enc. 1), the terms and the terms and conditions of the GSA contract GS-23F-0011L and this order at the price schedule on section A.1. Order Type: BLANKET PURCHASE AGREEMENT Total Contract Ceiling: $823,721.00 Total Obligated Amount: $0 Period of Performance: 36 months from date of award. Accepted: Signature Hannah S. Nunn Contracting Officer 10/2/08 Date		See CONTINUATION Page			

18 SHIPPING POINT

19 GROSS SHIPPING WEIGHT

20 INVOICE NO.

17(h) TOTAL (Cont. pages)

17(i). GRAND TOTAL

21 MAIL INVOICE TO

SEE BILLING INSTRUCTIONS ON REVERSE

a NAME Department of Interior
National Business Center

b STREET ADDRESS (or P O Box) Attn: Fiscal Services Branch - D2770 OR EMAIL TO NRCPAYMENTS_NBCDENVER@NBC.GOV
7301 W. Mansfield Avenue

c. CITY Denver d. STATE CO e ZIP CODE 80235-2230

22 UNITED STATES OF AMERICA
BY (Signature)

23. NAME (Typed) Stephen Pool
Contracting Officer
TITLE: CONTRACTING/ORDERING OFFICER

AUTHORIZED FOR LOCAL REPRODUCTION
PREVIOUS EDITION NOT USABLE

OPTIONAL FORM 347 (REV. 4/2006)
PRESCRIBED BY GSA/FAR 48 CFR 53.213(f)

SUNSI REVIEW COMPLETE JAN 08 2009

TEMPLATE - ADM001

ADM002

A.1 PRICE SCHEDULE

INCLUDES [redacted] LABORS RATE INCREASE, PER YEAR, IN ACCORDANCE WITH THE RATES ESTABLISED BY GSA.

YEAR 1 (10/3/2008 – 08/31/2009)

LABOR CATEBORY	RATE	EST. HRS.	SUBTOTAL
PRINCIPAL INVESTIGATOR	[redacted]		$31,911
SENIOR ENGINEER/SCIENTIST VI	[redacted]		$145,007
SENIOR ENGINEER/SCIENTIST V	[redacted]		$9,335
ENGINEER II	[redacted]		$2,244
ENGINEER I	[redacted]		$1,859
FUNCTIONAL SPECIALIST II	[redacted]		$1,250
FUNCTIONAL SPECIALIST I	[redacted]		$3,398
ADMINISTRATIVE ASSISTANT I	[redacted]		$926
TRAVEL	N/A	N/A	$16,671

TOTAL - [redacted]

YEAR 2 (9/1/2009 – 08/31/2010)

LABOR CATEBORY	RATE	EST. HRS.	SUBTOTAL
PRINCIPAL INVESTIGATOR	[redacted]		$35,760
SENIOR ENGINEER/SCIENTIST VI	[redacted]		$162,774
SENIOR ENGINEER/SCIENTIST V	[redacted]		$10,460
ENGINEER II	[redacted]		$2,442
ENGINEER I	[redacted]		$2,023
FUNCTIONAL SPECIALIST II	[redacted]		N/A
FUNCTIONAL SPECIALIST I	[redacted]		$3,737
ADMINISTRATIVE ASSISTANT I	[redacted]		$796
TRAVEL	N/A	N/A	$16,671

TOTAL - [redacted]

YEAR 3 (08/31/2010 – 10/3/2011)

LABOR CATEBORY	RATE (9/1/10 – 8/31/11)	EST. HRS.	SUBTOTAL	RATE (9/1/11 – 10/3/11)	EST. HRS.	SUBTOTAL
PRINCIPAL INVESTIGATOR	[redacted]					$3,090
SENIOR ENGINEER/SCIENTIST VI	[redacted]					$14,356
SENIOR ENGINEER/SCIENTIST V	[redacted]					$1,807
ENGINEER II	[redacted]					$139
ENGINEER I	[redacted]					$115
FUNCTIONAL SPECIALIST II	[redacted]					0
FUNCTIONAL SPECIALIST I	[redacted]					$252
ADMINISTRATIVE ASSISTANT I	[redacted]					$0
TRAVEL	N/A	N/A	N/A	N/A	N/A	$16,671
SUBTOTALS			[redacted]			$19,758

TOTAL - [redacted]

TOTAL ESTIMATED AWARD (CEILING): $823,721.00

A.2 SEGREGATION OF COSTS

a. The "Payments under Time-and-Materials and Labor-Hour Contracts" clause provides for reimbursement to the contractor of costs incurred for certain items and services purchased directly for the contract, subject to certain limitations set forth in the clause. Such items may include the lease/purchase of equipment, travel expenses for Government- directed travel, consumable materials, tuition and registration fees for specialized training, and other services or items acquired for the Government's account under the Government Property clause. The items and services which the BPA holder is authorized to purchase on a cost- reimbursement basis shall be limited to only those specific items and services described in the order(s) issued to the BPA holder as authorized for purchase.

b. The BPA holder shall segregate costs associated with materials and other items authorized to be purchased on a cost-reimbursement basis (to be specified in each order) from other costs associated with the performance of this contract in such a manner that at any time the costs subject to reimbursement under each order shall be readily ascertainable.

c. The "Ceiling Price" referred to in the "Payments under Time and Materials and Labor-Hour Contracts" clause shall be the ceiling price as stated in each order.

A.3 2052.216-72 TASK ORDER PROCEDURES (OCT 1999)

(a) Task order request for proposal. When a requirement within the scope of work for this contract is identified, the contracting officer shall transmit to the contractor a Task Order Request for Proposal (TORFP) which may include the following, as appropriate:

(1) Scope of work/meetings/travel and deliverables;

(2) Reporting requirements;

(3) Period of performance - place of performance;

(4) Applicable special provisions;

(5) Technical skills required; and

(6) Estimated level of effort.

(b) Task order technical proposal. By the date specified in the TORFP, the contractor shall deliver to the contracting officer a written or verbal (as specified in the TORFP technical proposal submittal instructions) technical proposal that provides the technical information required by the TORFP.

(c) Cost proposal. The contractor's cost proposal for each task order must be fully supported by cost and pricing data adequate to establish the reasonableness of the proposed amounts. When the contractor's estimated cost for the proposed task order exceeds $100,000 and the period of performance exceeds six months, the contractor may be required to submit a Contractor Spending Plan (CSP) as part of its cost proposal. The TORP indicates if a CSP is required.

(d) Task order award. The contractor shall perform all work described in definitized task orders issued by the contracting officer. Definitized task orders include the following:

(1) Statement of work/meetings/travel and deliverables;

(2) Reporting requirements;

(3) Period of performance;

(4) Key personnel;

(5) Applicable special provisions; and

(6) Total task order amount including any fixed fee.

A.4 2052.216-73 ACCELERATED TASK ORDER PROCEDURES (JAN 1993)

(a) The NRC may require the contractor to begin work before receiving a definitized task order from the contracting officer. Accordingly, when the contracting officer verbally authorizes the work, the contractor shall proceed with performance of the task order subject to the monetary limitation established for the task order by the contracting officer.

(b) When this accelerated procedure is employed by the NRC, the contractor agrees to begin promptly negotiating with the contracting officer the terms of the definitive task order and agrees to submit a cost proposal with supporting cost or pricing data. If agreement on a definitized task order is not reached by the target date mutually agreed upon by the contractor and contracting officer, the contracting officer may determine a reasonable price and/or fee in accordance with Subpart 15.8 and Part 31 of the FAR, subject to contractor appeal as provided in 52.233-1, Disputes. In any event, the contractor shall proceed with completion of the task order, subject only to the monetary limitation established by the contracting officer and the terms and conditions of the basic contract.

A.5 DURATION OF BPA PERIOD (MAR 1987)

The ordering period of this BPA shall commence on award date and will expire 36 months after award.

A.6 OBLIGATION OF FUNDS

This BPA does not obligate any funds. The Government is obligated only to the extent of authorized orders actually issued under the BPA by the Contracting Officer.

A.7 AUTHORIZED USERS

Government Contracting Officers representing US Nuclear Regulatory Commission are the only users authorized to place orders under this BPA. Any authorized user shall only be allowed to issue an order under this BPA if funds are certified and the BPA awarding office's Task Order number is assigned. BPA holders shall not accept or perform any purported order that does not contain a Task Order number.

A.8 2052.215-78 TRAVEL APPROVALS AND REIMBURSEMENT -ALTERNATE 1 (OCT 1999)

(a) Total expenditure for travel may not exceed $50,000 without the prior approval of the contracting officer.

(b) All foreign travel must be approved in advance by the NRC on NRC Form 445, Request for Approval of Official Foreign Travel, and must be in compliance with FAR 52.247-63 Preference for U.S. Flag Air Carriers. The contractor shall submit NRC Form 445 to the NRC no later than 30 days prior to the commencement of travel.

(c) The contractor will be reimbursed only for those travel costs incurred that are directly related to this contract and which are allowable subject to the limitations prescribed in FAR 31.205-46.

(d) It is the responsibility of the contractor to notify the contracting officer in accordance with the FAR Limitations of Cost clause of this contract when, at any time, the contractor learns that travel expenses will cause the contractor to exceed the travel ceiling amount identified in paragraph (a) of this clause.

(e) Reasonable travel costs for research and related activities performed at State and nonprofit institutions, in accordance with Section 12 of Pub. L. 100-679, shall be charged in accordance with the contractor's institutional policy to the degree that the limitations of Office of Management and Budget (OMB) guidance are not exceeded. Applicable guidance documents include OMB Circular A-87, Cost Principles for State and Local Governments; OMB Circular A-122, Cost Principles for Nonprofit Organizations; and OMB Circular A-21, Cost Principles for Educational Institutions.

A.9 2052.211-72 FINANCIAL STATUS REPORT (OCT 1999)

The contractor shall provide a monthly Financial Status Report (FSR) to the project officer and the contracting officer. The FSR shall include the acquisition of, or changes in the status of, contractor-held property acquired with government funds valued at the time of purchase at $50,000 or more. Whenever these types of property changes occur, the contractor shall send a copy of the report to the Chief, Property and Acquisition Oversight Branch, Office of Administration. The report is due within 15 calendar days after the end of the report period and must identify the title of the project, the contract number, the appropriate financial tracking code (e.g., Job Code Number or JCN) specified by the NRC Project Officer, project manager and/or principal investigator, the contract period of performance, and the period covered by the report. Each report must include the following for each discrete task:

(a) Total estimated contract amount.

(b) Total funds obligated to date.

(c) Total costs incurred this reporting period.

(d) Total costs incurred to date.

(e) Detail of all direct and indirect costs incurred during the reporting period for the entire contract or each task, if it is a task ordering contract.

(f) Balance of obligations remaining.

(g) Balance of funds required to complete contract/task order.

(h) Contractor Spending Plan (CSP) status: A revised CSP is required with the Financial Status Report whenever the contractor or the contracting officer has reason to believe that the total cost for performance of this contract will be either greater or substantially less than what had been previously estimated.

(1) Projected percentage of completion cumulative through the report period for the project/task order as reflected in the current CSP.

(2) Indicate significant changes in the original CSP projection in either dollars or percentage of completion. Identify the change, the reasons for the change, whether there is any projected overrun, and when additional funds would be required. If there have been no changes to the original NRC-approved CSP projections, a written statement to that effect is sufficient in lieu of submitting a detailed response to item "h".

(i) Property status:

(1) List property acquired for the project during the month with an acquisition cost between $500 and $49,999. Give the item number for the specific piece of equipment.

(2) Provide a separate list of property acquired for the project during the month with an acquisition cost of $50,000 or more. Provide the following information for each item of property: item description or nomenclature, manufacturer, model number, serial number, acquisition cost, and receipt date. If no property was acquired during the month, include a statement to that effect. The same information must be provided for any component or peripheral equipment which is part of a "system or system unit."

(3) For multi-year projects, in the September monthly financial status report provide a cumulative listing of property with an acquisition cost of $50,000 or more showing the information specified in paragraph (i)(2) of this clause.

(4) In the final financial status report provide a closeout property report containing the same elements as described above for the monthly financial status reports, for all property purchased with NRC funds regardless of value unless title has been vested in the contractor. If no property was acquired under the contract, provide a statement to that effect. The report should note any property requiring special handling for security, health, safety, or other reasons as part of the report.

(j) Travel status: List the starting and ending dates for each trip, the starting point and destination, and the traveler(s) for each trip.

(k) If the data in this report indicates a need for additional funding beyond that already obligated, this information may only be used as support to the official request for funding required in accordance with the Limitation of Cost (LOC) Clause (FAR 52.232-20) or the Limitation of Funds (LOF) Clause FAR 52.232-22.

A.10 PLACE OF DELIVERY--REPORTS (JUN 1988)

The items to be furnished hereunder shall be delivered, with all charges paid by the Contractor, to:

(a) Project Officer (1 copy) – electronic submission is acceptable and highly encouraged

(b) Contracting Officer (1 copy) - electronic submission is acceptable and highly encouraged

A.11 2052.215-70 KEY PERSONNEL (JAN 1993)

(a) The following individuals are considered to be essential to the successful performance of the work hereunder:

[redacted]

The contractor agrees that personnel may not be removed from the contract work or replaced without compliance with paragraphs (b) and (c) of this section.

(b) If one or more of the key personnel, for whatever reason, becomes, or is expected to become, unavailable for work under this contract for a continuous period exceeding 30 work days, or is expected to devote substantially less effort to the work than indicated in the proposal or initially anticipated, the contractor shall immediately notify the contracting officer and shall, subject to the con-currence of the contracting officer, promptly replace the personnel with personnel of at least substantially equal ability and qualifications.

(c) Each request for approval of substitutions must be in writing and contain a detailed explanation of the circumstances necessitating the proposed substitutions. The request must also contain a complete resume for the proposed substitute and other information requested or needed by the contracting officer to evaluate the

proposed substitution. The contracting officer and the project officer shall evaluate the contractor's request and the contracting officer shall promptly notify the contractor of his or her decision in writing.

(d) If the contracting officer determines that suitable and timely replacement of key personnel who have been reassigned, terminated, or have otherwise become unavailable for the contract work is not reasonably forthcoming, or that the resultant reduction of productive effort would be so substantial as to impair the successful completion of the contract or the service order, the contract may be terminated by the contracting officer for default or for the convenience of the Government, as appropriate. If the contracting officer finds the contractor at fault for the condition, the contract price or fixed fee may be equitably adjusted downward to compensate the Government for any resultant delay, loss, or damage.

A.12 2052.215-71 PROJECT OFFICER AUTHORITY (NOVEMBER 2006)

(a) The contracting officer's authorized representative (hereinafter referred to as the project officer) for this contract is:

Name: Al Csontos
Address: US NRC
Mail Stop: T-10-M-5
Washington DC 20555

Telephone Number: 301-415-6352
Email: Aladar.Csontos@nrc.gov

(b) Performance of the work under this contract is subject to the technical direction of the NRC project officer. The term "technical direction" is defined to include the following:

(1) Technical direction to the contractor which shifts work emphasis between areas of work or tasks, authorizes travel which was unanticipated in the Schedule (i.e., travel not contemplated in the Statement of Work (SOW) or changes to specific travel identified in the SOW), fills in details, or otherwise serves to accomplish the contractual SOW.

(2) Provide advice and guidance to the contractor in the preparation of drawings, specifications, or technical portions of the work description.

(3) Review and, where required by the contract, approval of technical reports, drawings, specifications, and technical information to be delivered by the contractor to the Government under the contract.

(c) Technical direction must be within the general statement of work stated in the contract. The project officer does not have the authority to and may not issue any technical direction which:

(1) Constitutes an assignment of work outside the general scope of the contract.

(2) Constitutes a change as defined in the "Changes" clause of this contract.

(3) In any way causes an increase or decrease in the total estimated contract cost, the fixed fee, if any, or the time required for contract performance.

(4) Changes any of the expressed terms, conditions, or specifications of the contract.

(5) Terminates the contract, settles any claim or dispute arising under the contract, or issues any unilateral directive whatever.

(d) All technical directions must be issued in writing by the project officer or must be confirmed by the project officer in writing within ten (10) working days after verbal issuance. A copy of the written direction must be

furnished to the contracting officer. A copy of NRC Form 445, Request for Approval of Official Foreign Travel, which has received final approval from the NRC must be furnished to the contracting officer.

(e) The contractor shall proceed promptly with the performance of technical directions duly issued by the project officer in the manner prescribed by this clause and within the project officer's authority under the provisions of this clause.

(f) If, in the opinion of the contractor, any instruction or direction issued by the project officer is within one of the categories as defined in paragraph (c) of this section, the contractor may not proceed but shall notify the contracting officer in writing within five (5) working days after the receipt of any instruction or direction and shall request the contracting officer to modify the contract accordingly. Upon receiving the notification from the contractor, the contracting officer shall issue an appropriate contract modification or advise the contractor in writing that, in the contracting officer's opinion, the technical direction is within the scope of this article and does not constitute a change under the "Changes" clause.

(g) Any unauthorized commitment or direction issued by the project officer may result in an unnecessary delay in the contractor's performance and may even result in the contractor expending funds for unallowable costs under the contract.

(h) A failure of the parties to agree upon the nature of the instruction or direction or upon the contract action to be taken with respect thereto is subject to 52.233-1 -Disputes.

(i) In addition to providing technical direction as defined in paragraph (b) of the section, the project officer shall:

(1) Monitor the contractor's technical progress, including surveillance and assessment of performance, and recommend to the contracting officer changes in requirements.

(2) Assist the contractor in the resolution of technical problems encountered during performance.

(3) Review all costs requested for reimbursement by the contractor and submit to the contracting officer recommendations for approval, disapproval, or suspension of payment for supplies and services required under this contract.

(4) Assist the contractor in obtaining the badges for the contractor personnel.

(5) Immediately notify the Security Branch, Division of Facilities and Security (SB/DFS) (via e-mail) when a contractor employee no longer requires access authorization and return of any NRC issued badge to SB/DFS within three days after their termination.

(6) Ensure that all contractor employees that require access to classified Restricted Data or National Security Information or matter, access to sensitive unclassified information (Safeguards, Official Use Only, and Proprietary information) access to sensitive IT systems or data, unescorted access to NRC controlled buildings/space, or unescorted access to protected and vital areas of nuclear power plants receive approval of SB/DFS prior to access in accordance with Management Directive and Handbook 12.3.

(7) For contracts for the design, development, maintenance or operation of Privacy Act Systems of Records, obtain from the contractor as part of closeout procedures, written certification that the contractor has returned to NRC, transferred to the successor contractor, or destroyed at the end of the contract in accordance with instructions provided by the NRC Systems Manager for Privacy Act Systems of Records, all records (electronic or paper) which were created, compiled, obtained or maintained under the contract.

A.13 OPTION PERIODS - TASK ORDER/DELIVERY ORDER UNDER A GSA FEDERAL SUPPLY SCHEDULE CONTRACT (MARCH 2007)

The Period of Performance (PoP) for this requirement may extend beyond the Offeror's current PoP on their GSA Schedule. Offerors may submit proposals for the entire PoP as long as their current GSA Schedule covers the requested PoP, or their GSA Schedule contains GSA's "Evergreen Clause" (Option to Extend the Term of the Contract), which covers the requested PoP if/when the option(s) are exercised. Offerors are encouraged to submit accurate/realistic pricing for the requirement's entire PoP, even if the proposed GSA Schedule does not include pricing for the applicable option years, etc.

For proposal evaluation purposes, the NRC assumes that applicable Evergreen Clause Option(s) will be exercised and the NRC will apply price analysis, as applicable. It is in the best interest of the Offeror to explain major deviations in escalation, proposed in any Evergreen Clause option years. Resulting GSA task/delivery order option years subject to the Evergreen Clause will be initially priced utilizing the same rates proposed under the last GSA-priced year of the subject GSA Schedule. Upon GSA's exercise of the GSA Schedule option year(s) applicable to the Evergreen Clause, the NRC will modify the awarded task/delivery order to incorporate either the proposed pricing for the option years or the GSA-approved pricing (whichever is lower).

It is incumbent upon the Offeror to provide sufficient documentation (GSA-signed schedule, schedule modifications, etc.) that shows both the effective dates, pricing and terms/conditions of the current GSA Schedule, as well as Evergreen Clause terms/conditions (as applicable). Failure to provide this documentation may result in the Offeror's proposal being found unacceptable.

A.14 WHISTLEBLOWER PROTECTION FOR NRC CONTRACTOR AND SUBCONTRACTOR EMPLOYEES (JULY 2006)

(a) The U.S. Nuclear Regulatory Commission (NRC) contractor and its subcontractor are subject to the Whistleblower Employee Protection public law provisions as codified at 42 U.S.C. 5851. NRC contractor(s) and subcontractor(s) shall comply with the requirements of this Whistleblower Employee Protection law, and the implementing regulations of the NRC and the Department of Labor (DOL). See, for example, DOL Procedures on Handling Complaints at 29 C.F.R. Part 24 concerning the employer obligations, prohibited acts, DOL procedures and the requirement for prominent posting of notice of Employee Rights at Appendix A to Part 24.

(b) Under this Whistleblower Employee Protection law, as implemented by regulations, NRC contractor and subcontractor employees are protected from discharge, reprisal, threats, intimidation, coercion, blacklisting or other employment discrimination practices with respect to compensation, terms, conditions or privileges of their employment because the contractor or subcontractor employee(s) has provided notice to the employer, refused to engage in unlawful practices, assisted in proceedings or testified on activities concerning alleged violations of the Atomic Energy Act of 1954 (as amended) and the Energy Reorganization Act of 1974 (as amended).

(c) The contractor shall insert this or the substance of this clause in any subcontracts involving work performed under this contract.

A.15 INVOICES - INSTRUCTIONS

ATTENTION: Invoice Billing Address Change Effective May 1, 2008

The Nuclear Regulatory Commission (NRC) has contracted with the National Business Center (NBC) to perform their payment processing.

Effective May 1, 2008, please submit all invoices to the NBC. Any invoices submitted to NRC after the effective date may result in a delay in processing and receiving your funds. Please send all invoice vouchers to the DOI located in Denver, Colorado. The new mailing address is:

Department of Interior

National Business Center
Attn: Fiscal Services Branch – D2770
7301 W. Mansfield Avenue
Denver, CO 80235-2230

You are encouraged to send your invoice voucher electronically to DOI. The e-mail address is NRCPayments@nbc.gov.

This notice is for change of billing address only; please continue to prepare vouchers or invoices as prescribed in your contract billing instructions. A contract modification to incorporate the new billing instruction will follow at a later date.

If you have any questions, please contact Romena Moy on 301-492-3603 or at romena.moy@nrc.gov.

NRCAR Clause §2052.235-70 Publication of research results

Publication of Research Results (Oct 1999)

(a) The principal investigator(s)/contractor shall comply with the provisions of NRC Management Directive 3.8 (Vol. 3, Part 1) and NRC Handbook 3.8 (Parts I-IV) regarding publication in refereed scientific and engineering journals or dissemination to the public of any information, oral or written, concerning the work performed under this contract. Failure to comply with this clause shall be grounds for termination of this contract.

(b) The principal investigator(s)/contractor may publish the results of this work in refereed scientific and engineering journals or in open literature and present papers at public or association meetings at interim stages of work, in addition to submitting to NRC the final reports and other deliverables required under this contract. However, such publication and papers shall focus on advances in science and technology and minimize conclusions and/or recommendations which may have regulatory implications.

(c) The principal investigator(s) shall coordinate all such publications with, and transmit a copy of the proposed article or paper to, the NRC Contracting Officer or Project Officer, prior to publication. The NRC agrees to review and provide comments within thirty (30) days after receipt of a proposed publication. However, in those cases where the information to be published is (1) subject to Commission approval, (2) has not been ruled upon, or (3) disapproved by the Commission, the NRC reserves the right to disapprove or delay the publication. Further, if the NRC disagrees with the proposed publication for any reason, it reserves the right to require that any publication not identify the NRC's sponsorship of the work and that any associated publication costs shall be borne by the contractor.

52.227-11 Patent Rights—Ownership by the Contractor. Patent Rights—Ownership by the Contractor (Dec 2007)

(a) As used in this clause—

"Invention" means any invention or discovery that is or may be patentable or otherwise protectable under title 35 of the U.S. Code, or any variety of plant that is or may be protectable under the Plant Variety Protection Act (7 U.S.C. 2321, *et seq.*)

"Made" means—

(1) When used in relation to any invention other than a plant variety, the conception or first actual reduction to practice of the invention; or

(2) When used in relation to a plant variety, that the Contractor has at least tentatively determined that the variety has been reproduced with recognized characteristics.

"Nonprofit organization" means a university or other institution of higher education or an organization of the type described in section 501(c)(3) of the Internal Revenue Code of 1954 (26 U.S.C. 501(c)) and exempt from

taxation under section 501(a) of the Internal Revenue Code (26 U.S.C. 501(a)), or any nonprofit scientific or educational organization qualified under a State nonprofit organization statute.

"Practical application" means to manufacture, in the case of a composition of product; to practice, in the case of a process or method; or to operate, in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that its benefits are, to the extent permitted by law or Government regulations, available to the public on reasonable terms.

"Subject invention" means any invention of the Contractor made in the performance of work under this contract.

(b) *Contractor's rights.*

(1) *Ownership.* The Contractor may retain ownership of each subject invention throughout the world in accordance with the provisions of this clause.

(2) *License.*

(i) The Contractor shall retain a nonexclusive royalty-free license throughout the world in each subject invention to which the Government obtains title, unless the Contractor fails to disclose the invention within the times specified in paragraph (c) of this clause. The Contractor's license extends to any domestic subsidiaries and affiliates within the corporate structure of which the Contractor is a part, and includes the right to grant sublicenses to the extent the Contractor was legally obligated to do so at contract award. The license is transferable only with the written approval of the agency, except when transferred to the successor of that part of the Contractor's business to which the invention pertains.

(ii) The Contractor's license may be revoked or modified by the agency to the extent necessary to achieve expeditious practical application of the subject invention in a particular country in accordance with the procedures in FAR 27.302(i)(2) and 27.304-1(f).

(c) *Contractor's obligations.*

(1) The Contractor shall disclose in writing each subject invention to the Contracting Officer within 2 months after the inventor discloses it in writing to Contractor personnel responsible for patent matters. The disclosure shall identify the inventor(s) and this contract under which the subject invention was made. It shall be sufficiently complete in technical detail to convey a clear understanding of the subject invention. The disclosure shall also identify any publication, on sale (*i.e.*, sale or offer for sale), or public use of the subject invention, or whether a manuscript describing the subject invention has been submitted for publication and, if so, whether it has been accepted for publication. In addition, after disclosure to the agency, the Contractor shall promptly notify the Contracting Officer of the acceptance of any manuscript describing the subject invention for publication and any on sale or public use.

(2) The Contractor shall elect in writing whether or not to retain ownership of any subject invention by notifying the Contracting Officer within 2 years of disclosure to the agency. However, in any case where publication, on sale, or public use has initiated the 1-year statutory period during which valid patent protection can be obtained in the United States, the period for election of title may be shortened by the agency to a date that is no more than 60 days prior to the end of the statutory period.

(3) The Contractor shall file either a provisional or a nonprovisional patent application or a Plant Variety Protection Application on an elected subject invention within 1 year after election. However, in any case where a publication, on sale, or public use has initiated the 1-year statutory period during which valid patent protection can be obtained in the United States, the Contractor shall file the application prior to the end of that statutory period. If the Contractor files a provisional application, it shall file a nonprovisional application within 10 months of the filing of the provisional application. The Contractor shall file patent applications in additional countries or international patent offices within either 10 months of the first filed patent application (whether provisional or nonprovisional) or 6 months from the date permission is granted by the Commissioner of Patents to file foreign patent applications where such filing has been prohibited by a Secrecy Order.

(4) The Contractor may request extensions of time for disclosure, election, or filing under paragraphs (c)(1), (c)(2), and (c)(3) of this clause.

(d) *Government's rights—*

(1) *Ownership.* The Contractor shall assign to the agency, on written request, title to any subject invention—

(i) If the Contractor fails to disclose or elect ownership to the subject invention within the times specified in paragraph (c) of this clause, or elects not to retain ownership; provided, that the agency may request title only within 60 days after learning of the Contractor's failure to disclose or elect within the specified times.

(ii) In those countries in which the Contractor fails to file patent applications within the times specified in paragraph (c) of this clause; provided, however, that if the Contractor has filed a patent application in a country after the times specified in paragraph (c) of this clause, but prior to its receipt of the written request of the agency, the Contractor shall continue to retain ownership in that country.

(iii) In any country in which the Contractor decides not to continue the prosecution of any application for, to pay the maintenance fees on, or defend in reexamination or opposition proceeding on, a patent on a subject invention.

(2) *License.* If the Contractor retains ownership of any subject invention, the Government shall have a nonexclusive, nontransferable, irrevocable, paid-up license to practice, or have practiced for or on its behalf, the subject invention throughout the world.

(e) *Contractor action to protect the Government's interest.*

(1) The Contractor shall execute or have executed and promptly deliver to the agency all instruments necessary to—

(i) Establish or confirm the rights the Government has throughout the world in those subject inventions in which the Contractor elects to retain ownership; and

(ii) Assign title to the agency when requested under paragraph (d) of this clause and to enable the Government to obtain patent protection and plant variety protection for that subject invention in any country.

(2) The Contractor shall require, by written agreement, its employees, other than clerical and nontechnical employees, to disclose promptly in writing to personnel identified as responsible for the administration of patent matters and in the Contractor's format, each subject invention in order that the Contractor can comply with the disclosure provisions of paragraph (c) of this clause, and to execute all papers necessary to file patent applications on subject inventions and to establish the Government's rights in the subject inventions. The disclosure format should require, as a minimum, the information required by paragraph (c)(1) of this clause. The Contractor shall instruct such employees, through employee agreements or other suitable educational programs, as to the importance of reporting inventions in sufficient time to permit the filing of patent applications prior to U.S. or foreign statutory bars.

(3) The Contractor shall notify the Contracting Officer of any decisions not to file a nonprovisional patent application, continue the prosecution of a patent application, pay maintenance fees, or defend in a reexamination or opposition proceeding on a patent, in any country, not less than 30 days before the expiration of the response or filing period required by the relevant patent office.

(4) The Contractor shall include, within the specification of any United States nonprovisional patent or plant variety protection application and any patent or plant variety protection certificate issuing thereon covering a subject invention, the following statement, "This invention was made with Government support under (identify the contract) awarded by (identify the agency). The Government has certain rights in the invention."

(f) *Reporting on utilization of subject inventions.* The Contractor shall submit, on request, periodic reports no more frequently than annually on the utilization of a subject invention or on efforts at obtaining utilization of the subject invention that are being made by the Contractor or its licensees or assignees. The reports shall include information regarding the status of development, date of first commercial sale or use, gross royalties received by the Contractor, and other data and information as the agency may reasonably specify. The Contractor also shall provide additional reports as may be requested by the agency in connection with any march-in proceeding undertaken by the agency in accordance with paragraph (h) of this clause. The Contractor also shall mark any utilization report as confidential/proprietary to help prevent inadvertent release outside the Government. As required by 35 U.S.C. 202(c)(5), the agency will not disclose that information to persons outside the Government without the Contractor's permission.

(g) *Preference for United States industry.* Notwithstanding any other provision of this clause, neither the Contractor nor any assignee shall grant to any person the exclusive right to use or sell any subject invention in the United States unless the person agrees that any products embodying the subject invention or produced through the use of the subject invention will be manufactured substantially in the United States. However, in individual cases, the requirement for an agreement may be waived by the agency upon a showing by the Contractor or its assignee that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States, or that under the circumstances domestic manufacture is not commercially feasible.

(h) *March-in rights.* The Contractor acknowledges that, with respect to any subject invention in which it has retained ownership, the agency has the right to require licensing pursuant to 35 U.S.C. 203 and 210(c), and in accordance with the procedures in 37 CFR 401.6 and any supplemental regulations of the agency in effect on the date of contract award.

(i) Special provisions for contracts with nonprofit organizations. If the Contractor is a nonprofit organization, it shall—

(1) Not assign rights to a subject invention in the United States without the written approval of the agency, except where an assignment is made to an organization that has as one of its primary functions the management of inventions, *provided*, that the assignee shall be subject to the same provisions as the Contractor;

(2) Share royalties collected on a subject invention with the inventor, including Federal employee co-inventors (but through their agency if the agency deems it appropriate) when the subject invention is assigned in accordance with 35 U.S.C. 202(e) and 37 CFR 401.10;

(3) Use the balance of any royalties or income earned by the Contractor with respect to subject inventions, after payment of expenses (including payments to inventors) incidental to the administration of subject inventions for the support of scientific research or education; and

(4) Make efforts that are reasonable under the circumstances to attract licensees of subject inventions that are small business concerns, and give a preference to a small business concern when licensing a subject invention if the Contractor determines that the small business concern has a plan or proposal for marketing the invention which, if executed, is equally as likely to bring the invention to practical application as any plans or proposals from applicants that are not small business concerns; *provided*, that the Contractor is also satisfied that the small business concern has the capability and resources to carry out its plan or proposal. The decision whether to give a preference in any specific case will be at the discretion of the Contractor.

(5) Allow the Secretary of Commerce to review the Contractor's licensing program and decisions regarding small business applicants, and negotiate changes to its licensing policies, procedures, or practices with the Secretary of Commerce when the Secretary's review discloses that the Contractor could take reasonable steps to more effectively implement the requirements of paragraph (i)(4) of this clause.

(j) *Communications.* [*Complete according to agency instructions.*]

(k) *Subcontracts.*

(1) The Contractor shall include the substance of this clause, including this paragraph (k), in all subcontracts for experimental, developmental, or research work to be performed by a small business concern or nonprofit organization.

(2) The Contractor shall include in all other subcontracts for experimental, developmental, or research work the substance of the patent rights clause required by FAR Subpart 27.3.

(3) At all tiers, the patent rights clause must be modified to identify the parties as follows: references to the Government are not changed, and the subcontractor has all rights and obligations of the Contractor in the clause. The Contractor shall not, as part of the consideration for awarding the subcontract, obtain rights in the subcontractor's subject inventions.

(4) In subcontracts, at any tier, the agency, the subcontractor, and the Contractor agree that the mutual obligations of the parties created by this clause constitute a contract between the subcontractor and the agency with respect to the matters covered by the clause; provided, however, that nothing in this paragraph is intended to confer any jurisdiction under the Contract Disputes Act in connection with proceedings under paragraph (h) of this clause.

52.227-14 Rights in Data—General

(a) *Definitions.* As used in this clause—

"Computer database" or "database means" a collection of recorded information in a form capable of, and for the purpose of, being stored in, processed, and operated on by a computer. The term does not include computer software.

"Computer software"—

(1) Means

(i) Computer programs that comprise a series of instructions, rules, routines, or statements, regardless of the media in which recorded, that allow or cause a computer to perform a specific operation or series of operations; and

(ii) Recorded information comprising source code listings, design details, algorithms, processes, flow charts, formulas, and related material that would enable the computer program to be produced, created, or compiled.

(2) Does not include computer databases or computer software documentation.

"Computer software documentation" means owner's manuals, user's manuals, installation instructions, operating instructions, and other similar items, regardless of storage medium, that explain the capabilities of the computer software or provide instructions for using the software.

"Data" means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to contract administration, such as financial, administrative, cost or pricing, or management information.

"Form, fit, and function data" means data relating to items, components, or processes that are sufficient to enable physical and functional interchangeability, and data identifying source, size, configuration, mating and attachment characteristics, functional characteristics, and performance requirements. For computer software it means data identifying source, functional characteristics, and performance requirements but specifically excludes the source code, algorithms, processes, formulas, and flow charts of the software.

"Limited rights" means the rights of the Government in limited rights data as set forth in the Limited Rights Notice of paragraph (g)(3) if included in this clause.

"Limited rights data" means data, other than computer software, that embody trade secrets or are commercial or financial and confidential or privileged, to the extent that such data pertain to items, components, or processes developed at private expense, including minor modifications.

"Restricted computer software" means computer software developed at private expense and that is a trade secret, is commercial or financial and confidential or privileged, or is copyrighted computer software, including minor modifications of the computer software.

"Restricted rights," as used in this clause, means the rights of the Government in restricted computer software, as set forth in a Restricted Rights Notice of paragraph (g) if included in this clause, or as otherwise may be provided in a collateral agreement incorporated in and made part of this contract, including minor modifications of such computer software.

"Technical data" means recorded information (regardless of the form or method of the recording) of a scientific or technical nature (including computer databases and computer software documentation). This term does not include computer software or financial, administrative, cost or pricing, or management data or other information incidental to contract administration. The term includes recorded information of a scientific or technical nature that is included in computer databases (See 41 U.S.C. 403(8)).

"Unlimited rights" means the rights of the Government to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose, and to have or permit others to do so.

(b) Allocation of rights.

(1) Except as provided in paragraph (c) of this clause, the Government shall have unlimited rights in—

(i) Data first produced in the performance of this contract;

(ii) Form, fit, and function data delivered under this contract;

(iii) Data delivered under this contract (except for restricted computer software) that constitute manuals or instructional and training material for installation, operation, or routine maintenance and repair of items, components, or processes delivered or furnished for use under this contract; and

(iv) All other data delivered under this contract unless provided otherwise for limited rights data or restricted computer software in accordance with paragraph (g) of this clause.

(2) The Contractor shall have the right to—

(i) Assert copyright in data first produced in the performance of this contract to the extent provided in paragraph (c)(1) of this clause;

(ii) Use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, unless provided otherwise in paragraph (d) of this clause;

(iii) Substantiate the use of, add, or correct limited rights, restricted rights, or copyright notices and to take other appropriate action, in accordance with paragraphs (e) and (f) of this clause; and

(iv) Protect from unauthorized disclosure and use those data that are limited rights data or restricted computer software to the extent provided in paragraph (g) of this clause.

(c) Copyright—

(1) Data first produced in the performance of this contract.

(i) Unless provided otherwise in paragraph (d) of this clause, the Contractor may, without prior approval of the Contracting Officer, assert copyright in scientific and technical articles based on or containing data first produced in the performance of this contract and published in academic, technical or professional journals, symposia proceedings, or similar works. The prior, express written permission of the Contracting Officer is required to assert copyright in all other data first produced in the performance of this contract.

(ii) When authorized to assert copyright to the data, the Contractor shall affix the applicable copyright notices of 17 U.S.C. 401 or 402, and an acknowledgment of Government sponsorship (including contract number).

(iii) For data other than computer software, the Contractor grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license in such copyrighted data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly by or on behalf of the Government. For computer software, the Contractor grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license in such copyrighted computer software to reproduce, prepare derivative works, and perform publicly and display publicly (but not to distribute copies to the public) by or on behalf of the Government.

(2) *Data not first produced in the performance of this contract.* The Contractor shall not, without the prior written permission of the Contracting Officer, incorporate in data delivered under this contract any data not first produced in the performance of this contract unless the Contractor—

(i) Identifies the data; and

(ii) Grants to the Government, or acquires on its behalf, a license of the same scope as set forth in paragraph (c)(1) of this clause or, if such data are restricted computer software, the Government shall acquire a copyright license as set forth in paragraph (g)(4) of this clause (if included in this contract) or as otherwise provided in a collateral agreement incorporated in or made part of this contract.

(3) *Removal of copyright notices.* The Government will not remove any authorized copyright notices placed on data pursuant to this paragraph (c), and will include such notices on all reproductions of the data.

(d) *Release, publication, and use of data.* The Contractor shall have the right to use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, except—

(1) As prohibited by Federal law or regulation (*e.g.*, export control or national security laws or regulations);

(2) As expressly set forth in this contract; or

(3) If the Contractor receives or is given access to data necessary for the performance of this contract that contain restrictive markings, the Contractor shall treat the data in accordance with such markings unless specifically authorized otherwise in writing by the Contracting Officer.

(e) Unauthorized marking of data.

(1) Notwithstanding any other provisions of this contract concerning inspection or acceptance, if any data delivered under this contract are marked with the notices specified in paragraph (g)(3) or (g) (4) if included in this clause, and use of the notices is not authorized by this clause, or if the data bears any other restrictive or limiting markings not authorized by this contract, the Contracting Officer may at any time either return the data to the Contractor, or cancel or ignore the markings. However, pursuant to 41 U.S.C. 253d, the following procedures shall apply prior to canceling or ignoring the markings.

(i) The Contracting Officer will make written inquiry to the Contractor affording the Contractor 60 days from receipt of the inquiry to provide written justification to substantiate the propriety of the markings;

(ii) If the Contractor fails to respond or fails to provide written justification to substantiate the propriety of the markings within the 60-day period (or a longer time approved in writing by the Contracting Officer for good cause shown), the Government shall have the right to cancel or ignore the markings at any time after said period and the data will no longer be made subject to any disclosure prohibitions.

(iii) If the Contractor provides written justification to substantiate the propriety of the markings within the period set in paragraph (e)(1)(i) of this clause, the Contracting Officer will consider such written justification and determine whether or not the markings are to be cancelled or ignored. If the Contracting Officer determines that the markings are authorized, the Contractor will be so notified in writing. If the Contracting Officer

determines, with concurrence of the head of the contracting activity, that the markings are not authorized, the Contracting Officer will furnish the Contractor a written determination, which determination will become the final agency decision regarding the appropriateness of the markings unless the Contractor files suit in a court of competent jurisdiction within 90 days of receipt of the Contracting Officer's decision. The Government will continue to abide by the markings under this paragraph (e)(1)(iii) until final resolution of the matter either by the Contracting Officer's determination becoming final (in which instance the Government will thereafter have the right to cancel or ignore the markings at any time and the data will no longer be made subject to any disclosure prohibitions), or by final disposition of the matter by court decision if suit is filed.

(2) The time limits in the procedures set forth in paragraph (e)(1) of this clause may be modified in accordance with agency regulations implementing the Freedom of Information Act (5 U.S.C. 552) if necessary to respond to a request thereunder.

(3) Except to the extent the Government's action occurs as the result of final disposition of the matter by a court of competent jurisdiction, the Contractor is not precluded by paragraph (e) of the clause from bringing a claim, in accordance with the Disputes clause of this contract, that may arise as the result of the Government removing or ignoring authorized markings on data delivered under this contract.

(f) Omitted or incorrect markings.

(1) Data delivered to the Government without any restrictive markings shall be deemed to have been furnished with unlimited rights. The Government is not liable for the disclosure, use, or reproduction of such data.

(2) If the unmarked data has not been disclosed without restriction outside the Government, the Contractor may request, within 6 months (or a longer time approved by the Contracting Officer in writing for good cause shown) after delivery of the data, permission to have authorized notices placed on the data at the Contractor's expense. The Contracting Officer may agree to do so if the Contractor—

(i) Identifies the data to which the omitted notice is to be applied;

(ii) Demonstrates that the omission of the notice was inadvertent;

(iii) Establishes that the proposed notice is authorized; and

(iv) Acknowledges that the Government has no liability for the disclosure, use, or reproduction of any data made prior to the addition of the notice or resulting from the omission of the notice.

(3) If data has been marked with an incorrect notice, the Contracting Officer may—

(i) Permit correction of the notice at the Contractor's expense if the Contractor identifies the data and demonstrates that the correct notice is authorized; or

(ii) Correct any incorrect notices.

(g) Protection of limited rights data and restricted computer software.

(1) The Contractor may withhold from delivery qualifying limited rights data or restricted computer software that are not data identified in paragraphs (b)(1)(i), (ii), and (iii) of this clause. As a condition to this withholding, the Contractor shall—

(i) Identify the data being withheld; and

(ii) Furnish form, fit, and function data instead.

(2) Limited rights data that are formatted as a computer database for delivery to the Government shall be treated as limited rights data and not restricted computer software.

(3) [Reserved]

(h) *Subcontracting.* The Contractor shall obtain from its subcontractors all data and rights therein necessary to fulfill the Contractor's obligations to the Government under this contract. If a subcontractor refuses to accept terms affording the Government those rights, the Contractor shall promptly notify the Contracting Officer of the refusal and shall not proceed with the subcontract award without authorization in writing from the Contracting Officer.

(i) *Relationship to patents or other rights.* Nothing contained in this clause shall imply a license to the Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Government.

ENCLOSURE 1 - STATEMENT OF WORK

OFFICE OF NUCLEAR REGULATORY RESEARCH
DIVISION OF ENGINEERING

Reactor Coolant Pressure Boundary Analyses

BACKGROUND

Many pressurized water reactor (PWR) primary reactor coolant pressure boundary (RCPB) components contain nickel-based alloys to include Alloys 82, 182, and 600. Primary coolant water coupled with the operating conditions of PWR plants has been shown to cause cracking of Alloy 82, 182, and 600 through a process called primary water stress corrosion cracking (PWSCC). PWSCC in nickel-based RCPB components is a safety concern due to the potential for reactor pressure boundary leaks and the associated potential of boric acid corrosion of low alloy steels at nozzle-to-safe end dissimilar metal (DM) butt welds. Either condition, depending on the size and location of the flaws, could result in a loss of coolant accident (LOCA). Specific plant operating experiences identifying PWSCC in Alloy 82, 182, and 600 through leakage or in-service inspections include:

- In 1993, Palisades discovered a leak through a circumferential crack in the Alloy 600 safe end on the pressurizer nozzle for the power-operated relief valve. The circumferential extent of the crack was about 3 inches in the 4-inch diameter pipe. Metallurgical analysis of a sample characterized the cracking as PWSCC of the Alloy 600 safe end material in the heat-affected zone of the Alloy 82 and 182 weld. This was the first instance of PWSCC associated with butt welds at a U.S. reactor licensed by the NRC.
- In 2000, ultrasonic examination of a reactor pressure vessel (RPV) hot leg nozzle-to-safe end DM weld at Ringhals 4 in Sweden revealed four axial part-through-wall flaws. Metallurgical analysis attributed the cracking to PWSCC. Two small axial indications were identified in a Ringhals 3 RPV hot leg nozzle-to-safe end DM weld. These indications were left in service until a follow up inspection in 2001, at which time; the indications were sampled and analyzed to be PWSCC.
- In 2000, a large accumulation of boric acid deposits was observed during a refueling outage at V.C. Summer which led to the discovery of cracking in the "A" hot leg pipe-to-RPV nozzle DM weld. The weld contained a through-wall axial flaw and small part-through-wall axial flaws, as well as a circumferential flaw. Metallurgical analysis attributed the cracking to PWSCC. Small axial and circumferential cracks were identified in the "B" hot leg pipe-to-RPV nozzle DM welds; a small circumferential crack was identified in the "C" hot leg pipe-to-RPV nozzle DM weld; and a small circumferential crack was found in both the "A" and "C" cold leg pipe-to-RPV nozzle DM welds.
- In 2003, ultrasonic examination of the pressurizer surge line hot leg nozzle-to-safe end weld at Three Mile Island Unit 1 revealed an axial part-through-wall indication in a DM weld. The licensee attributed the indication to PWSCC.
- In 2003, Tsuruga 2 in Japan observed boron deposits on the surface of a pressurizer relief valve nozzle that led to the discovery of three axially oriented flaws in the nozzle-to-safe end DM weld. Subsequent nondestructive examination (NDE) of the safety valve nozzle revealed two additional axial flaws in the nozzle-to-safe end DM weld. Metallurgical analysis of the flaws identified PWSCC as the mechanism for flaw initiation and growth.
- In 2003, ultrasonic examination revealed a shallow axial indication in the pressurizer-to-surge line weld at Tihange 2 in Belgium. This indication was attributed to PWSCC.
- In 2005, ultrasonic examination identified two axial part-through-wall indications approximately 180 degrees apart in a 2 inch hot leg drain nozzle-to-safe end DM weld at Calvert Cliffs Unit 2. The Licensee attributed the indications to PWSCC.

- In 2005, ultrasonic examination identified an axial part-through-wall indication in a pressurizer nozzle-to-safe end DM weld for the pressurizer safety valve at D. C. Cook Unit 1. The licensee attributed the indication to PWSCC.
- In 2006, ultrasonic examinations at Calvert Cliffs Unit 1 identified an axial indication in the pressurizer relief nozzle-to-safe end DM weld and a circumferential indication in the hot leg surge line nozzle-to-safe end DM weld and a hot leg drain nozzle-to-safe end DM weld. The circumferential indication in the hot leg to surge line nozzle-to-safe end was 2.4 inches in length and approximately 25 percent through-wall in depth. The circumferential indication in the hot leg drain nozzle was 0.45 inches in length and approximately 18 percent through-wall in depth.
- In October 2006, Wolf Creek reported five circumferential indications in three pressurizer DM welds. Three indications were in the pressurizer surge line nozzle-to-safe end weld, and one indication was found in each of the safety and relief nozzle-to-safe end welds. The relief nozzle-to-safe end flaw was measured as 11.5 inches long as projected on the outside diameter of the weld.
- In January 2008, Davis Besse reported a leakage event from a 1.68" axial PWSCC flaw that broke through-wall during the initial bead layering of a full structural weld overlay on the hot leg decay heat removal line.
- In March 2008, Crystal River reported two circumferential flaws in their hot leg decay heat removal line as well with the largest being 10 inches in length with a nominal wall thickness of 1.3".

The industry responded to these PWSCC instances with a detailed research program coordinated through the Materials Reliability Program (MRP). The MRP program has focused on four key technical areas: 1) non-destructive evaluation techniques to detect and size PWSCC flaws, 2) PWSCC initiation and growth rate statistics, 3) probabilistic and deterministic advanced finite element based component integrity models, and 4) PWSCC mitigation technologies. The objective of these mitigation technologies is to significantly retard future PWSCC initiation and growth. Several technologies have been identified by the industry such as water chemistry modifications (zinc additions and hydrogen injection), mechanical stress improvement, full structural weld overlays, optimized weld overlays, peening, inlays, onlays, and other potential processes. NRC reviews of these technologies are ongoing and will require continued assessments for a variety of different plant specific applications and RCPB locations to include leak-before-break (LBB) piping systems.

NRC started approving LBB analyses in 1984 by granting exemptions from General Design Criterion (GDC) - 4, "Environmental and dynamics effects design bases." In 1987, GDC-4 was revised to allow dynamic effects associated with postulated pipe ruptures to be excluded from the design basis when analyses reviewed and approved by the Commission demonstrate that the probability of fluid system piping rupture is extremely low (i.e., less than 10^{-6}/RY). The statement of considerations for the proposed revision to GDC-4 in 1986 said that "the LBB approach should not be considered applicable to fluid system piping that operating experience has indicated is particularly susceptible to failure from the effects of corrosion." Draft Standard Review Plan (SRP) 3.6.3, "LBB Evaluation Procedures," says, "...evaluations must demonstrate that these [degradation] mechanisms are not potential sources of pipe rupture." In practice, review criteria were implemented by excluding systems with potential corrosion degradation mechanisms. Satisfying draft SRP review criteria was considered a demonstration that the probability of fluid system piping rupture is extremely low.

SRP 3.6.3 also contains guidance on the application of LBB to boiling water reactor (BWR) piping which is susceptible to intergranular stress corrosion cracking (IGSCC). The draft SRP indicates that LBB could be considered for this piping provided two mitigation methods (e.g., resistant materials, stress improvement, enhanced water chemistry) were applied to the piping. In the regulatory actions taken to provide acceptable inspection intervals for managing IGSCC in BWR piping, credit has been given for the number of mitigation techniques employed. At the time these criteria were developed, they were based on engineering judgment. However, it has been observed through operating experience that two mitigation methods in BWR piping provided improved resistance to IGSCC as compared to one method and that the use of two mitigation methods renders the piping highly resistant to cracking. Nevertheless, owners of BWRs have not requested NRC approval to apply LBB to this piping.

Recently, the MRP has prepared inspection and evaluation guidelines for DM butt welds in the reactor coolant system. These guidelines are contained in MRP-139, "Primary System Piping Butt Weld Inspection and Evaluation Guidelines," and the Nuclear Energy Institute provided them to the NRC staff on July 27, 2005. These guidelines 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. These industry guidelines do not discriminate between welds approved by the NRC staff for LBB and other DM butt welds. In a draft user need letter dated August 5, 2005, from J.E. Dyer, Director, Office of Nuclear Reactor Regulation, to Carl J. Paperiello, Director, Office of Nuclear Reactor Regulation, "User Need Request on PWSCC in LBB Systems," assistance from the RES was requested in the development of a position on the management of PWSCC in LBB piping systems.

As a result, the NRC has developed several research programs to address the various aspects of developing a strategy to manage PWSCC in LBB and RCPB components. The NRC programs mirrors the MRP program to confirm the industry's claims related to: 1) capabilities of non-destructive evaluation techniques to detect and size PWSCC flaws, 2) PWSCC initiation and growth rate statistics, 3) probabilistic and deterministic advanced finite element based component integrity models, and 4) PWSCC mitigation technologies. For 3), a robust component integrity analysis typically consists of PWSCC flaw growth calculations that evaluate the specific component design, configuration, fabrication, applied loads, and environmental degradation effects such as PWSCC growth rates. It is only through evaluating all four areas that a PWSCC mitigation and management strategy can be developed for LBB and RCPB systems.

OBJECTIVE

The objective of this project is to provide flexible technical analyses to RES to develop and/or confirm the technical bases for future regulatory decisions related to RCPB and LBB system integrity and associated PWSCC mitigation assessments.

SCOPE OF WORK

This contract will be a GSA BPA contract that will assess RCPB component integrity, evaluate RCPB PWSCC mitigation related proposals, review current and future ASME code cases, and provide technical assistance related to RCPB and LBB issues.

Specific task orders will be issued and negotiated after contract award as deemed necessary.

Overall, the deliverables from this project will provide the RES with information needed to determine the long term regulatory actions that provide reasonable assurance of public health and safety in the area of RCPB and LBB analyses.

PERIOD OF PERFORMANCE

The period of performance for this contract will be 36 months from the date the contract is awarded.

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:

(a) Results meet the objectives (75% of overall score)
  1 Justification of major assumptions (12%)
  2 Soundness of technical approach and results (52%)
  3 Uncertainties and sensitivities addressed (11%)

(b) Documentation of research results and methods is adequate (25% of overall score)
  1 Clarity of presentation (16%)

2 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.

TECHNICAL AND OTHER SPECIAL QUALIFICATIONS NEEDED

The program manager, key personnel, and any other senior technical staff performing work under this contract shall have expertise, experience, and/or education in the following key areas:

(a) Expertise in materials and structural mechanics
(b) Expertise in finite element analyses
(c) Expertise in developing probabilistic codes
(d) Expertise in leakage detection methodology and leak-rate calculations with existing leak-rate codes
(e) Detailed knowledge of pressurized water reactor piping system design and manufacturing methods including material property information
(f) Detailed knowledge of techniques used to evaluate residual stresses in pipe welds, e.g. weld sequencing
(g) Detailed knowledge of industry and NRC staff analyses regarding reported occurrences of primary water stress corrosion cracking and NRC actions, e.g., notices, bulletins, etc..

REPORTING REQUIREMENTS

A Monthly Letter Status Report (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:

Sharon Haggerty, Management Analyst, Mail Stop: T-10D5, sharon.haggerty@nrc.gov
Robert Hardies, Branch Chief, Mailstop: T-10M5, robert.hardies@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, lis 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 project manager.

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 Project Manager. The RES Project Manager shall either approve the material as submitted, approve it subject to NRC suggested revisions, or disapprove it. In any event, the RES Project Manager 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.
ORGANIZATIONAL CONFLICT OF INTEREST DISCLOSURE (DC adds COI language for commercial contracts)

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.

Four five-day trips to ASME meetings per year for up to two people during the period of performance and up to six two-day trips for up to 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:

Mail Stop: T-10 M5
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555-0001

Phone: (301) 415-6352
Fax: (301) 415-5074
Email: (aladar.csontos@nrc.gov)

Hand-Carried mail should be sent to:
U. S. Nuclear Regulatory Commission
Mail Stop: T-10M5
11545 Rockville Pike
Rockville, MD 20852-2738