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| 3. ORDER NO. 4. REQUISITION/REFERENCE NO. 31310018F0068 NRR-18-0094 | | | NUCLE. | AR 1 | REGULATORY CO | OMMISSI | EON | | | | | | |
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TASK ORDER – Unrestricted EWC IDIQ for Energy Research, Inc.

SECTION B - SUPPLIES OR SERVICES AND PRICE/COSTS

B.1 BRIEF PROJECT TITLE AND WORK DESCRIPTION

(a) Review of WCAP-16747-P, POLCA-T: System Analysis Code with Three-Dimensional Core Model, Appendices C and D" for BWR 2-6.

(b) Summary work description: The objective of this task order is to obtain expertise from to assist the NRC staff in determining the technical adequacy of the POLCA-T code and application methodology for determining the behavior of BWR/2-6 during AOOs and ATWS events. The contractor must provide all resources necessary to accomplish the tasks and deliverables described in this statement of work (SOW).

B.2 CONSIDERATION AND OBLIGATION-TASK ORDERS

(a) The ceiling of this order for services is **\$72,701.45**.

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

(c) The amount presently obligated with respect to this order is **sector** (**control** in Cost, in fixed fee). The obligated amount shall, at no time, exceed the order ceiling as specified in paragraph (a) above. When and if the amount(s) paid and payable to the Contractor hereunder shall equal the obligated amount, the Contractor shall not be obligated to continue performance of the work unless and until the Contracting Officer shall increase the amount obligated with respect to this order, in accordance with FAR Part 43 - Modifications. Any work undertaken by the Contractor in excess of the obligated amount specified above is done so at the Contractor's sole risk and may not be reimbursed by the Government.

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

(e) Fixed Fee Holdback Amount:

(End of clause)

B.3 PRICE/COST SCHEDULE

| CLIN | DESCRIPTION | ESTIMATED COST |
|--------------------|---|----------------|
| 0001 | Labor | |
| 0002 | Travel | |
| 0003 | ODC | |
| SUBTOT | AL (rounded) | |
| 0004 | Indirect Cost Pool (includes G&A, Fringe, Overhead and Subcontractor Handling) | |
| SUBTOTAL (rounded) | | |
| 0005 | Fixed-Fee | |
| TOTAL | | \$72,701.45 |

| Base and Exercised Options | \$72,701.45 |
|----------------------------|-------------|
| Base and All Options | \$72,701.45 |

TASK ORDER STATEMENT OF WORK (SOW)

"TECHNICAL ASSISTANCE FOR THE REVIEW OF WCAP-16747-P, POLCA-T: SYSTEM ANALYSIS CODE WITH THREE-DIMENSIONAL CORE MODEL, APPENDICES C AND D" FOR BWR 2-6"

1. EWC TASK ORDER TITLE

Review of WCAP-16747-P, POLCA-T: System Analysis Code with Three-Dimensional Core Model, Appendices C and D" for BWR 2-6.

2. BACKGROUND

The Topical Report (TR), WCAP-16747-P describes Westinghouse Electric Company methodology and models for analyzing boiling water reactor (BWR) transients using POLCA-T. POLCA-T is an advanced dynamic system analysis code with the three-dimensional (3-D) core physics described by the nodal code POLCA presented in the topical report CENPD-390-P-A Revision 0. POLCA-T is a computer code for transient thermal-hydraulic and neutron-kinetic analysis of BWRs. It can be used as a general tool for advanced simulation of single- and two-phase flow systems including non-condensable gases.

Appendix C of the TR provides qualification basis of the POLCA-T code for application to the transient analysis and evaluation of anticipated operational occurrences (AOOs) in BWR/2-6. Appendix D of the TR provides the qualification basis of the POLCA-T code for application to the analysis of anticipated transients without scram (ATWS) in advanced boiling water reactors (ABWR) and in operating boiling water reactors (BWR/2-6). The POLCA-T code has been demonstrated to perform licensing analysis of ATWS events for BWR/2-6 plants. Appendix D is an extension of the qualification studies presented for AOOs in Appendix C.

Appendix C of the TR describes the methodology for licensing transient analysis of AOOs using POLCA-T. AOOs are those conditions/events at normal operation that are expected to occur one or more times during the life of the nuclear power plant (NPP). The AOO events are grouped according to four categories consistent with Chapter 15 of the NRC Standard Review Plan (NUREG-0800):



Appendix D describes the code qualification of POLCA-T for analyzing ATWS events. POLCA-T has already been approved by the NRC for CRDA and BWR stability analysis. An ATWS is an AOO followed by the failure of the reactor trip portion of the reactor protection system (RPS), as specified in the General Design Criteria (GDC) Criterion 20 of Appendix A of 10 CFR 50. Since

the probability of an AOO with simultaneous failure of RPS trip has a lower than that of the AOO itself, ATWS events are classified as beyond design basis accidents and treated separately in Chapter 15.8 of the SRP. ATWS events are mitigated by manual/automatic reactor shutdown scenarios: reactor shutdown by alternate rod injection (10CFR 50.62) or in case of total failure of ARI, a backup capability of fine control rod drive (FMCRD) run-in and reactor shutdown by manual or automatic activation of Standby Liquid Control system (SLCS) in case of failure of ARI and FMCRD.

Scope of the analysis consists of demonstration of the acceptable use of POLCA-T for its application to the analysis ATWS events in BWR/2-6. ATWS licensing acceptance criteria consists of fuel integrity, peak reactor coolant pressure boundary (RCPB) system pressure, containment integrity (mass-3nergy release to the containment), and long-term shutdown cooling.

2.1 Status of Review

On February 8, 2017, Westinghouse requested a change in review status of the topical report WCAP-16747, Appendices C and D, "POLCA-T: System Analysis Code with Three-Dimensional Core Model," (ADAMS Accession No. ML17044A006). In this letter Westinghouse requested NRC staff to place their review on hold due to unforeseen circumstances would effective Westinghouse's ability to support an effective and efficient review of the topical report. Westinghouse further indicated that they expected to reactivate the review by first quarter of 2018. By letter dated March 6, 2017 (ADAMS Accession No. ML17054C841), NRC approved the request for the suspension of the review of WCAP-16747 Appendices C and D topical report.

By letter dated January 24, 2018 (ADAMS Accession No. ML18025B020), Westinghouse informed NRC that they are in a position to support an effective and efficient review of the report with the NRC and accordingly they requested NRC to reactivate the NRR review of WCAP-16747, Appendices C and D for application to the operating BWR plants (BWR/2-6).

Prior to the suspension of the review, the NRC staff and the contractor reviewed and evaluated the POLCA-T code and application methodology to determine the adequacy, technical accuracy, and regulatory compliance of the included evaluation models. Based on the initial review, the NRC staff and contractor identified the need for additional information and prepared an audit plan related to the TR review (ADAMS Accession No. ML15196A374). This document is a combination of requests for additional information (RAIs) as well as an audit plan that describes the scope and purpose of the audit, identifies the audit team and provides a list of documents required by the NRC staff. This audit plan covers both ABWR and BWR/2-6 as the TR was originally intended. However, by letter dated January 24, 2018, Westinghouse requested the review to be restricted to only BWR/2-6, therefore, some of the ABWR RAIs need to be revised and modified and added to the BWR/2-6 RAIs, where applicable.

3. OBJECTIVE(S)

The objective of this task order is to obtain expertise from to assist the NRC staff in determining the technical adequacy of the POLCA-T code and application methodology for determining the behavior of BWR/2-6 during AOOs and ATWS events. The contractor must provide all resources necessary to accomplish the tasks and deliverables described in this statement of work (SOW).

Major scope of this task order involves review of the technical and regulatory basis for the POLCA-T code and application methodology. Also the task includes review of the benchmarking, calibration, and validation of the code and application methodology to ensure the acceptability of

the code system. Also the work requires to identify the need for additional information or clarification and prepare a technical letter report.

4. STATEMENT OF WORK TASKS

Using the criteria and guidelines found in Standard Review Plan (SRP) Chapter 4 and Chapter 15; review the Westinghouse POLCA-T code for AOO analysis and ATWS analysis applications.

Task 1: Evaluation of the Topical Report

The contractor shall review Westinghouse POLCA-T code and determine the acceptability of the POLCA-T code system and methodology based on the benchmarking and validation of the POLCA-T code and application methodology. As for the level of effort assumption for this task, it is understood that the contractor shall provide sufficient empirical data to justify their results and conclusion; otherwise, an RAI list should be generated; no other empirical data should be considered other than what is provided by the vendor.

The contractor shall review the audit plan which includes the RAIs that were drafted during the initial review (ADAMS Accession No.ML15196A374). If appropriate, the contractor shall revise the RAIs and prepare a Technical Letter Report

If required, meetings or conference calls may be arranged between TR vendor (Westinghouse), the contractor and the NRC staff to resolve any issues related to the RAIs and may result in modifying the RAIs.

Task 2: Preparation for Audit

The contractor shall prepare and support a five-day audit to NRC Headquarters or vendor facility. The contractor shall provide a trip report that contains a summary of the major issues discussed, any agreements reached, and the basis/bases for agreement, any actions pending who has the responsibility doing what by when, as well as list of attendees. Include any slides or other presentations made by the vendor. The level of effort estimate for the trip is based on a two person five day trip. Prior to any trip taken, the contractor will obtain written approval from the COR, Alternate COR, or CO

Task 3: Review and Evaluation of RAI Response

The contractor shall perform a review of the responses to the RAIs and determine whether the RAI responses are in support of the calibration and validation of the POLCA-T code and application methodology, and identify any limitations. The contractor shall determine if the benchmarking and empirical databases support the expected application of the POLCA-T code and application methodology. To Clarify RAI responses, the COR or alternate COR will arrange for conference call with the vendor. The contractor shall participate in the telephone conference calls to discuss and clarify the nature of the RAIs in order arrive at a mutual understanding of the issues and to reach resolution.

The contractor shall prepare a technical letter report that includes a summary of the RAIs, a summary of the vendor's responses to the RAIs, and a summary why it is acceptable. For RAIs responses that are unacceptable, formulate follow-on RAI(s).

Task 4: Preparation for Final Technical Evaluation Report

Subtask 4.A. Based on the work performed during the review, the contractor shall prepare a draft technical evaluation report (TER) that contains the results of the work performed and submit to the COR and Alternate COR. NRC staff will provide comments on the draft TER.

Subtask 4.B: The contractor will address the NRC staff's comments and prepare the final TER.

5. APPLICABLE DOCUMENTS AND STANDARDS

- 1. WCAP-16747-P, Appendices C and D Revision 0, "POLCA-T: System Analysis Code with Three-Dimensional Core Model, Appendices C and D," Westinghouse Electric Company, October 2010.
- WCAp-16747-P-A, Revision 0, POLCA-T: System Analysis Code with Three-Dimensional Core Model," Westinghouse
- 3. Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition (NUREG-0800), Sections 4 and 15.
- 4. CENPD-300-P Supplement1, "Reference Safety Report for Boiling Water Reactor Fuel and Core Analyses, Westinghouse/CE, September 2010.

6. DELIVERABLES/MILESTONE SCHEDULE AND REPORTING REQUIREMENTS

The presently anticipated schedule for deliverables/milestones required under this contract is outlined in Table 1 below. All deliverables shall be provided electronically to the NRC COR in MS Word format. The MS Word documents should be saved such that they are compatible with previous MS Word versions. In addition, certain deliverables shall also be provided electronically in PDF format. This schedule shall be updated as necessary and provided to the NRC COR periodically upon request.

DELIVERABLE/MILESTONE SCHEDULE

| Task | Deliverable/Milestone | Quantity/Media | Completion Date |
|------|---|----------------|--|
| 1 | A technical letter report that contains the results evaluation of the adequacy, technical accuracy, and qualification of the models and component calculation devices, evaluation of the benchmarking and empirical databases support, any open items, and conclusions with any limitations. Provide a list of RAIs (if required) and the basis for the request. | | This document is due 12 weeks after award of the task order. |
| | A technical letter report that contains the results of the evaluation of the code system adequacy based on the benchmarking and validation, any open items and conclusions with any limitations. Provide a separate list of RAIs information (if required) and the basis | | Six weeks after the completion of Task 1. |

| | for the request. | | |
|----|---|---|--|
| 2 | For the audit, submit a trip report that contains a summary of the significant highlights of the audit. The trip report should note the disposition of items reviewed during the audit. In addition, the trip report should provide insights for the possible resolution of any remaining open items. | Electronic MS Word Format | Four weeks after trip. |
| 3 | 1 5 | | Four weeks after the receipt of the RAI responses. |
| 4A | | | Six weeks after receiving NRC comments or after completion of Task 3, whichever is later. |
| 4B | A Final TER incorporating NRC comments. | Electronic MS Word Format and PDF Format | Two weeks after receipt of NRC comments on draft TER. |

Note: This delivery schedule may be modified after task order award via Technical Direction from the COR, provided Contractor has agreed to the changes incorporated in the Technical Direction letter.

For all deliverables, including the monthly letter status report, please include the following on distribution:



7. <u>Technical Directions</u>

The COR may issue Technical Directions (TDs) from time to time throughout the duration of the task order. These TDs must be within scope of the task order SOW and shall not constitute new assignments of work or changes of such a nature as to constitute a change to the task order cost or period of performance. Any modifications to the scope of work, cost, or period of performance of this task order must be issued by the task order Contracting Officer (CO) and shall be coordinated with the task order Contracting Officer's Representative (COR). The COR may issue TDs for the purpose of making adjustments or clarifications to the timing and performance of the tasks/sub-tasks (if applicable) and/or the milestone schedule/delivery schedule of the documents within this task order.

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

8. GOVERNMENT-FURNISHED PROPERTY

A copy of the documents containing the topical report WCAP-16747-P Appendices C and D will be provided to the contractor by the COR upon award of the task order. As needed, additional documents and references necessary to complete the review of the topical report will be provided by the COR.

9. PLACE OF PERFORMANCE

All work will be performed at the contractor's site. If required, the contract will provide one or two people to support an audit of the Topical Report information at the NRC Headquarters or a vendor facility.

10. SPECIAL CONSIDERATIONS

10.1 TRAVEL

Anticipated meetings and other activities requiring Contractor travel are summarized in Table 2 below.

| | | Table 2 - Anticipated Tr | avel | | |
|------|---------------|---------------------------------|--------------------|------------------|------------------------------|
| Task | Purpose | Location | Number of Trips | Days per Trip | Staff Members per Trip |
| 2 | Audit Support | NRC HQ or TR Vendor Location | 1 | 5 | 2 |

Contractor will be authorized travel expenses consistent with the substantive provisions of the Federal Travel Regulation (FTR) and the limitation of funds specified in this contract/order. All travel requires written Government approval from the CO, unless otherwise delegated to the COR.

Travel will be reimbursed in accordance with FAR 31.205-46, "Travel costs" and the General Services Administration's Federal Travel Regulations at: http://www.gsa.gov/portal/content/104790.

All travel requires prior written approval from the COR.

10.2 SECURITY

Work performed under this contract will require access to Sensitive Unclassified Information (SUNSI), specifically propriety information.

SECTION F - Deliveries or Performance

NRCF030A PERIOD OF PERFORMANCE ALTERNATE I

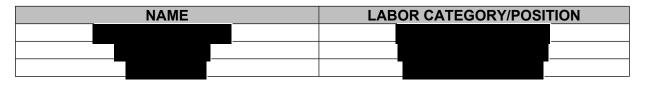
This order shall commence on June 1, 2018 and will expire on July 30, 2019. (See FAR 52.216-18 - Ordering).

(End of Clause)

SECTION H - Special Contract Requirements

2052.215-70 KEY PERSONNEL. (JAN 1993)

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



*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 concurrence 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.

(End of Clause)

CONTRACTING OFFICER'S REPRESENTATIVE

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

| NRC COR: |
|--|
| Name: Leslie Perkins |
| Office: Office of Nuclear Reactor Regulation (NRR) |
| Street Address: 11555 Rockville Pike, |
| Rockville, MD 20852 |
| E-Mail: |
| |

NRC Alternate COR: Name: Mathew Panicker Office: Office of Nuclear Reactor Regulation (NRR) Street Address: 11555 Rockville Pike, Rockville, MD 20852, Mail Stop: E-Mail:

(b) Performance of the work under this contract is subject to the technical direction of the NRC COR. 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 or changes to specific travel identified in the Statement of Work), fills in details, or otherwise serves to accomplish the contractual statement of work.

(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, approve 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 COR or must be confirmed by the COR 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 COR's authority under the provisions of this clause.

(f) If, in the opinion of the contractor, any instruction or direction issued by the COR is within one of the categories 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 that 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 COR 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 to the instruction or direction 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.

(End of Clause)

SECTION J - List of Documents, Exhibits and Other Attachments

Attachments:

- 1. Monthly Letter Status Report Template
- 2. Cost Reimbursement Billing Instructions