

ORDER FOR SUPPLIES OR SERVICES

PAGE OF PAGES

1

25

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

1. DATE OF ORDER 06/30/2015		2. CONTRACT NO. (If any) NRC-HQ-25-14-E-0002		6. SHIP TO:	
3. ORDER NO. NRC-HQ-60-15-T-0001		4. REQUISITION/REFERENCE NO. RES-15-0299		a. NAME OF CONSIGNEE US NUCLEAR REGULATORY COMMISSION-	
5. ISSUING OFFICE (Address correspondence to) US NRC - HQ ACQUISITION MANAGEMENT DIVISION MAIL STOP 3WFN-05-C64MP ATTN HUGO ALCANTARA 301-415-0069 WASHINGTON DC 20555-0001				b. STREET ADDRESS MAIL PROCESSING CENTER 4930 BOILING BROOK PARKWAY	
				c. CITY ROCKVILLE	e. ZIP CODE 20852
7. TO:				f. SHIP VIA	
a. NAME OF CONTRACTOR ENERGY RESEARCH INC				8. TYPE OF ORDER	
b. COMPANY NAME				<input type="checkbox"/> a. PURCHASE REFERENCE YOUR	
c. STREET ADDRESS 6189 EXECUTIVE BLVD				<input checked="" type="checkbox"/> 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.	
d. CITY ROCKVILLE		e. STATE MD	f. ZIP CODE 208523901	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.	
9. ACCOUNTING AND APPROPRIATION DATA See Schedule				10. REQUISITIONING OFFICE OFF OF NUCLEAR REG RESEARCH	
11. BUSINESS CLASSIFICATION (Check appropriate box(es)) <input checked="" type="checkbox"/> a. SMALL <input type="checkbox"/> b. OTHER THAN SMALL <input type="checkbox"/> c. DISADVANTAGED <input type="checkbox"/> d. WOMEN-OWNED <input type="checkbox"/> e. HUBZone <input type="checkbox"/> f. SERVICE-DISABLED VETERAN-OWNED <input type="checkbox"/> g. WOMEN-OWNED SMALL BUSINESS (WOSB) ELIGIBLE UNDER THE WOSB PROGRAM <input type="checkbox"/> h. EDWOSB					12. F.O.B. POINT
13. PLACE OF		14. GOVERNMENT B/L NO.		15. DELIVER TO F.O.B. POINT ON OR BEFORE (Date)	
a. INSPECTION Destination	b. ACCEPTANCE Destination			16. DISCOUNT TERMS 30	

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)
	NRC-HQ-25-14-E-0002/NRC-HQ-60-15-T-0001 ERI EWC SB TO 04 "MELCOR Model Development and Model Maintenance" Continued ...					

SEE BILLING INSTRUCTIONS ON REVERSE	18. SHIPPING POINT		19. GROSS SHIPPING WEIGHT		20. INVOICE NO.		17(h) TOTAL (Cont. pages)	
	21. MAIL INVOICE TO:							
	a. NAME US NUCLEAR REGULATORY COMMISSION						\$211,004.12	
	b. STREET ADDRESS (or P.O. Box) ONE WHITE FLINT NORTH 11555 ROCKVILLE PIKE MAILSTOP 03-E17A							
c. CITY ROCKVILLE						d. STATE MD	e. ZIP CODE 20852-2738	17(i) GRAND TOTAL
							\$330,340.71	

22. UNITED STATES OF AMERICA BY (Signature)

23. NAME (Typed)
MARK THOMPSON
TITLE: CONTRACTING/ORDERING OFFICER

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PREVIOUS EDITION NOT USABLE

OPTIONAL FORM 347 (Rev. 2/2012)
Prescribed by GSA/FAR 48 CFR 53.213(f)

SUNSI REVIEW COMPLETE

JUL 16 2015

ADMM002

TEMPLATE - ADMM002

ORDER FOR SUPPLIES OR SERVICES
SCHEDULE - CONTINUATION

PAGE NO

2

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

DATE OF ORDER

CONTRACT NO.

ORDER NO

06/30/2015

NRC-HQ-25-14-E-0002

NRC-HQ-60-15-T-0001

ITEM NO. (a)	SUPPLIES/SERVICES (b)	QUANTITY ORDERED (c)	UNIT (d)	UNIT PRICE (e)	AMOUNT (f)	QUANTITY ACCEPTED (g)
	<p>Contractor POC (Business): Tracey Mullinix, Contract Administrator Email: tlm@eri-world.com Phone: 301-881-0866</p> <p>Contractor POC (Technical): Dr. Mohsen Kahtib-Rahbar, President Email: mkrl@eri-world.com Phone: 301-881-0866</p> <p>Accounting Info: 2015-X0200-FEEBASED-60-60D003-17-6-161-1061-252A</p>					
00001	<p>MELCOR Model Development, Model Maintenance, & Technical Assistance CPFF</p> <p>Estimated Cost:\$211,004.12</p> <p>Incrementally Funded Amount: \$100,000.00</p>				211,004.12	
00002	<p>Optional Task 2 CPFF</p> <p>Amount: \$119,336.59(Option Line Item)</p> <p>Anticipated Exercise Date06/01/2016</p> <p>Estimated Cost:\$119,336.59</p> <p>The obligated amount of award: \$100,000.00. The total for this award is shown in box 17(i).</p>				0.00	

TOTAL CARRIED FORWARD TO 1ST PAGE (ITEM 17(H))

\$211,004.12

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OPTIONAL FORM 348 (Rev. 4/2006)

Prescribed by GSA FAR (48 CFR) 53.213(f)

CONTRACTOR ACCEPTANCE OF TASK ORDER NRC-HQ-60-15-T-0001

Acceptance of Task Order No: NRC-HQ-60-15-T-0001 should be made by having an official, authorized to bind your organization, execute two copies of this document in the space provided and return one copy to the Contracting Officer. You should retain the other copy for your records.

Accepted Task Order No. NRC-HQ-60-15-T-0001:

Mohsen Khatir-Rahman

Name

President

Title

6/30/15

Date

SECTION B - Supplies or Services/Prices

NRCB010 BRIEF PROJECT TITLE AND WORK DESCRIPTION (AUG 2011)

- (a) The title of this project is: "MELCOR Model Development, Model Maintenance"
- (b) Summary work description: The objective of this task order is to maintain MELCOR models developed for DBA and BDBA accidents, provide technical assistance to NRC staff with in-house MELCOR analysis of DBA and BDBA accidents for licensing reviews (and pre-licensing activities), such as Design Certification, Environmental, Combined License, Rulemaking, etc., for advance reactor designs, and assist in the development of technical documents, audits of applicants' analyses, and review meetings, such as ACRS reviews.

PRICE/COST SCHEDULE

ITEM NO.	DESCRIPTION OF SUPPLIES/SERVICES	ESTIMATED COST	FIXED FEE	TOTAL ESTIMATED CPFF
00001	MELCOR Model Development, Model Maintenance, and Technical Assistance			
00002	Task 2 (Optional)			
Total				\$330,340,71

NRCB040A CONSIDERATION AND OBLIGATION—COST-PLUS-FIXED-FEE ALTERNATE I (AUG 2011)

- (a) The total estimated cost to the Government for full performance of this contract is **\$330,340.71** of which the sum of represents the estimated reimbursable costs, and of which represents the fixed-fee.
- (b) The amount currently obligated by the Government with respect to this contract is **\$100,000.00**, of which the sum of represents the estimated reimbursable costs, and of which represents the fixed-fee.
- (c) This is an incrementally-funded contract and FAR 52.232-22 - "Limitation of Funds" applies.
- (d) In accordance with FAR 52.216-8 - Fixed Fee, it is the policy of the NRC to withhold payment of fee after payment of percent of the fee has been paid in order to protect the Government's interest. The amount of fixed-fee withheld from the contractor will not exceed 15 percent of the total fee or \$ whichever is less. Accordingly, the maximum amount of fixed-fee that may be held in reserve is

SECTION C - Description/Specifications

Statement of Work

1. PROJECT TITLE

MELCOR Model Development, Model Maintenance, and Technical Assistance for Licensing and Pre-licensing Activities Related to Design Basis and Beyond Design Basis Accidents

This task order effort falls under paragraph 3.7 "APR-1400 Design Center", within the scope of the Small Business EWC SOW.

2. BACKGROUND

On December 23 2014, the Applicant, Korea Hydro and Nuclear Power Co., Ltd. (KHNP), submitted the revised APR1400 Design Certification (DC) for review by the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactors (NRO). The NRC staff has completed an acceptance review and judged that the APR1400 design certification application is sufficiently complete to conduct a detailed technical review.

In support of reviewing the APR1400 design, NRO requires technical assistance to maintain the APR1400 MELCOR model that has been under development by an NRC contractor based on the design and other updates provided to the NRC by the Applicant or based on further analyses that are performed. Additional technical assistance is required to complete in-house confirmatory calculations, development of refined MELCOR models, and performance of confirmatory calculations for both containment Design Basis Accidents (DBAs) and Beyond Design Basis Accidents (BDBAs) in support of the on-going licensing review activities.

The U.S. Nuclear Regulatory Commission (NRC) will be receiving design certification applications for Small Modular Reactors (SMRs) for staff review. Currently, NuScale has proposed its plans for submission of its application. The Office of New Reactors (NRO) intends to proceed early to identify and examine key technical issues related to these reactors. In support of these efforts, NRO requires assistance in developing computer code input models, and assessing code capabilities and experimental benchmarking studies are important as they can provide insights into these technical issues.

The MELCOR models used as the basis for the tasks under this SOW were developed by Energy Research, Inc. (ERI) over the past two years. The contractor of this task order must have extensive experience with MELCOR Modeling, associated control logic, and Analyses, and be able to expeditiously become familiar with the historical analyses currently available to the NRC in a time frame which would meet the scheduling needs of NRO.

The Office of Research (RES) is providing support to NRO in the aforementioned areas.

3. SCOPE OF WORK

The objective of this work is for the contractor to maintain MELCOR models developed for DBA and BDBA accidents, provide technical assistance to NRC staff with in-house MELCOR analysis of DBA and BDBA accidents for licensing reviews (and pre-licensing activities), such as Design Certification, Environmental, Combined License, Rulemaking, etc., for advance reactor designs, and assist in the development of technical documents, audits of applicants' analyses,

and review meetings, such as ACRS reviews. The contractor may be called to perform DBA and BDBA confirmatory calculations if requested. Additional analysis for regulatory purposes may be required during the period of performance for this task order.

The Contractor must provide resources necessary to accomplish the tasks and deliverables described in this statement of work (SOW).

4. SPECIFIC TASKS

Task 0: Kick-off Meeting

Discuss plan of actions and logistics. Provide the required feedback, information and staff clarifications to complete the tasks for this task order. This meeting shall be held during the first week after the task order is awarded.

Task 1: Develop and Maintain MELCOR models used for Licensing and Pre-licensing Activities

SUBTASK 1.1: Maintain MELCOR model for APR1400 and provide technical assistance

The contractor shall maintain the MELCOR model that has been under development by Energy Research, Inc. (ERI) for the APR1400 used for DBA and BDBA accidents when updates, or requests for improvements, are provided by the NRC. The contractor shall maintain calculation notebooks which reflect updates to the model. Also, in the course of performing analyses with the model, the staff may uncover modeling errors, and the contractor shall correct these errors. After making requested model updates and error corrections, the contractor shall re-run test (shakedown) cases and document the results to ensure the adequacy of the deck.

The contractor shall provide technical assistance to NRC staff performing in-house confirmatory analyses using the MELCOR model for licensing reviews, such as design certification, construction permits, rulemaking, and licensing. The in-house calculations may be either DBAs or BDBAs. In addition, the contractor may suggest performing MELCOR calculations in support of the licensing review of documents submitted by the Applicant. Furthermore, the contractor shall provide technical assistance in the development of Requests for Additional Information (RAI's) to improve the performance of the MELCOR model and determine the reason for deviations between the MELCOR results and those presented by the Applicant, as needed. The technical assistance provided to NRC staff is expected to include the following:

- Assistance with understanding the workings of the model.
- Assistance with developing additional scenario-specific input beyond that included in the base model.
- Assistance with understanding the bases for modeling choices made in developing the model.
- Help understanding unexpected or counter-intuitive results obtained with the model.
- Support for emerging issues encountered when using the model.

The contractor shall provide technical assistance to NRC staff during licensing documentation reviews, technical and public meetings, such as ACRS and ASLB meetings or hearings, etc., and drafting licensing documentation.

Standard: The contractor shall submit the deliverable on time to the NRC COR and NRC

contracting officer (CO) and the deliverable shall include items specified above.

Acceptance criteria: Documentation and input models developed as part of this task will be submitted to an internal Quality Assurance (QA) review. This QA review requires that documented information, as well as MELCOR models, are reviewed and verified by an independent reviewer (another competent engineer who did not contribute to the development or documentation of the section being reviewed).

SUBTASK 1.2: Develop MELCOR Input Decks for the NuScale-Like Test Facility

The contractor shall develop MELCOR input decks for the NuScale-specific test facilities in order to assess the performance of MELCOR in predicting the measured test conditions.

Contractor shall review the facility design report, prepare requests for additional information (RAIs), where applicable, prepare a facility-specific MELCOR 2.1 input deck and associated calculation notebook. The calculation deck shall include assumptions, modeling options, and code work-arounds (where applicable).

Standard: The contractor shall submit the deliverable on time to the NRC COR and NRC contracting officer (CO) and the deliverable shall include items specified above.

Acceptance criteria: The documentation should list benchmarking results, and summarize the recommendations succinctly and consistently with the results of the analyses on which they are based.

SUBTASK 1.3: Benchmarking of NuScale MELCOR Predictions Against Selected Test Data & Development of Insights and Recommendations

Contractor shall identify up to six test cases for which experimental data are available from the NuScale vendor and/or identify specific measured parameters to be acquired from the vendor, if not already reported in the vendor reports submitted to NRC. Subsequently, contractor shall perform MELCOR simulations of the selected tests, documenting comparisons with the available test data, and shall document potential improvements or recommendations that would enhance MELCOR's predictive capabilities applicable to the phenomena specific to NuScale design (e.g., evaluation of performance of MELCOR modeling of heat transfer in helical tube steam generators, and condensation of steam at near vacuum, sub-atmospheric, and high pressure conditions, etc. as appropriate).

Standard: The contractor shall submit the deliverable on time to the NRC COR and NRC contracting officer (CO) and the deliverable shall include items specified above.

Acceptance criteria: The documentation should list benchmarking results, and summarize the recommendations succinctly and consistently with the results of the analyses on which they are based. Documentation and input models developed as part of this task will be submitted to an internal Quality Assurance (QA) review by the Contractor. This QA review requires that documented information, as well as MELCOR models, are reviewed and verified by an independent reviewer (another competent engineer who did not contribute to the development or documentation of the section being reviewed).

Task 2: Perform Confirmatory Licensing Calculations

SUBTASK 2.1. OPTIONAL: APR1400 Design Basis Accident Confirmatory Calculations

The NRC has the option to request the contractor perform confirmatory assessments of licensing documentation, such as construction permit/design certification submittals, etc., using the MELCOR input models under DBA conditions. The scenarios shall be selected for cases for which adequate results for comparison are also available in the KHNP submittals or material available for staff review. These analyses shall be defined in close coordination with pertinent cognizant NRC staff. The models should be based on conservative assumptions regarding initial and boundary conditions (e.g., heat transfer correlations, stored energy, mass and energy release, initial pressure, nodalization, and delay in safety system actuation, etc.) with comparisons of results to that utilize best-estimate models in MELCOR. The confirmatory calculations are expected to be limited to no more than three accident scenarios/cases, but additional cases may be performed if deemed necessary. The contractor shall document the results in a report. The report will be reviewed by NRC staff, then revised as necessary and submitted as final.

Standard: The contractor shall submit deliverables on time to the NRC COR and NRC contracting officer (CO). The deliverable will include a letter report or a memorandum describing code assessments performed as part of this task.

Acceptance criteria: Calculations performed as part of this task will undergo an internal review. A QA review requires that calculations are reviewed and verified by an independent reviewer (another competent engineer who did not contribute to the analyses).

SUBTASK 2.2. OPTIONAL: APR1400 Beyond Design Basis Accident (Severe) Confirmatory Calculations

The NRC has the option to request the contractor perform confirmatory assessments of licensing documentation, such as construction permit/design certification submittals, etc., using the MELCOR input models under BDBA conditions. These analyses shall be defined in close coordination with pertinent cognizant NRC staff. This shall enable comparisons of the MELCOR-calculated results to those of the Applicant. The contractor shall document the results in a report. The report will be reviewed by NRC staff, then revised as necessary and submitted as final.

Standard: The contractor shall submit deliverables on time to the NRC COR and NRC contracting officer (CO). The deliverable will include a letter report or a memorandum describing code assessments performed as part of this task.

Acceptance criteria: Calculations performed as part of this task will undergo an internal review. A QA review requires that calculations are reviewed and verified by an independent reviewer (another competent engineer who did not contribute to the analyses).

SUBTASK 2.3. OPTIONAL: NuScale Confirmatory Calculations

The contractor shall update the MELCOR input model and calculation notebook for NuScale design based on the latest plant design data submitted by the Applicant. Additionally, the contractor shall support the application of the MELCOR input models for use in confirmatory assessment of the construction permit/design certification submittals. These analyses will be identified by NRO and RES that are expected to focus on phenomena that are either unique or of greater significance to NuScale as compared with large PWRs (e.g., flow chugging behavior,

mixing in the riser section, stratification inside the containment cooling pool, impact of non-condensable gases and condensation of steam at near-vacuum, sub atmospheric, and high pressure conditions on the inner surface of the containment, reactor vent valve flow choking, natural circulation heat transfer in the reactor building pool, hydrogen mixing inside containment, impact of boron depletion inside the RPV affecting mass and energy release into the containment and boron plating on the containment wall on its heat removal capability, 3-D effects on containment heat transfer, etc.). The models shall be based on conservative assumptions regarding initial and boundary conditions, e.g., heat transfer correlations, stored energy, M&E release, initial pressure, nodalization, and delay in safety system actuation. The confirmatory calculations will be limited to a total of 5 representative scenarios encompassing design basis and severe accident conditions.

Standard: The contractor shall submit deliverables on time to the NRC COR and NRC contracting officer (CO) and the deliverable shall include items specified above.

Acceptance criteria: Analysis results shall be reviewed prior to documentation, and results compared, where available, with the applicant's analyses. Areas where differences are noted shall be highlighted. Documentation and input models developed as part of this task require an internal QA review by the contractor. A QA review requires that documented information, as well as MELCOR models are reviewed and verified by an independent reviewer (another competent engineer who did not contribute to the development or documentation of the section being reviewed).

Task 3: Technical Support for Vendor-Specific Audits

SUBTASK 3.1. APR1400

NRO anticipates undertaking audits of the APR1400 DBA and BDBA analyses to better understand the analyses performed by the Applicant and to disposition any issues resulting from the NRC's confirmatory calculations. These audits will examine the technical bases for the Applicant's analyses, assumptions, computer codes, and potential modeling limitations. The contractor shall support the NRC by preparing, participating and formulating insights and conclusions as they impact the design certification process.

Standard: The contractor shall submit deliverables on time to the NRC COR and NRC contracting officer (CO) and the deliverable shall include items specified above.

Acceptance criteria: Audit issues/areas shall be identified consistent with the issues determined based on the NRC's confirmatory analyses and findings.

SUBTASK 3.2. NuScale

NRO anticipates undertaking audits of the NuScale DBA and BDBA analyses to better understand the analyses performed by the Applicant and to disposition any issues resulting from the NRC's confirmatory calculations. These audits will examine the technical bases for the Applicant's analyses, assumptions, computer codes, and potential modeling limitations. The contractor shall support the NRC by preparing, participating and formulating insights and conclusions as they impact the design certification process.

Standard: The contractor shall submit deliverables on time to the NRC COR and NRC contracting officer (CO) and the deliverable shall include items specified above.

Acceptance criteria: Audit issues/areas shall be identified consistent with the issues determined based on the NRC's confirmatory analyses and findings.

5. RESEARCH QUALITY

The quality of NRC research programs are assessed each year by the Advisory Committee on Reactor Safeguards. Within the context of their reviews of RES programs, the definition of quality research is based upon several major characteristics:

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

Documentation of research results and methods is adequate (25% of overall score)
Clarity of presentation (16%)
Identification of major assumptions (9%)

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

6. APPLICABLE DOCUMENTS AND STANDARDS

N/A

7. DELIVERABLES AND DELIVERY SCHEDULE/REPORTING REQUIREMENTS

A Monthly Letter Status Report (MLSR) is to be submitted to the NRC COR by the 20th of the month following the month to be reported with copies provided to the following:

RESDSAMLSR.Resource@nrc.gov

ContractsPOT.Resource@nrc.gov

The MLSR will identify the title of the project, the job code, the Principal Investigator, the period of performance, the reporting period, summarize each month's technical progress, the monthly spending, total spending to date, and the remaining funds and will contain information as directed in NRC Management Direction 11.1. The contractor shall itemize the progress presented in the MLSR based on the subtasks presented in the statement of work. 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 COR.

The contractor shall provide the deliverables in electronic format unless directed by the COR. The electronic format shall be provided using a Microsoft-based product, (e.g., Outlook, Word, Excel, PowerPoint) unless the COR and the contractor specifically agree on another format. Deliverables shall be in the format of draft version, revision version with redline/strikeout with a change-control appendix, and a revised version which can be the final version. The contractor shall maintain appropriate revision control in an electronic format.

For each "final" deliverable (e.g., preliminary, draft, or final) that accomplishes a specific portion

of a subtask activity, the contractor shall provide an electronic copy to the COR. The contractor shall explicitly state in its submittal that the product provided is the deliverable for Task/Subtask XX, as further described below.

The schedule for deliverables shall be contained in the approved Project Plan for the task order effort, which is included as a deliverable in the table below.

The above deliverables shall be submitted to the task order CO and task order COR. Unless otherwise directed by the COR or the CO, the contractor must provide deliverables except the Monthly Letter Status Reports (MLSR) as draft products. The COR will review draft deliverables (and coordinate any internal NRC staff review, if needed) and provide comments back to the contractor. The contractor shall revise the draft deliverable based on the comments provided by the COR and then deliver a revised version of the deliverable, which will then be considered the Final Version. When mutually-agreed upon between the contractor and the COR, the contractor may submit preliminary or partial drafts to help gauge the contractor's understanding of the particular work requirement. More than one round of drafts may be needed if the contractor does not successfully incorporate the COR's comments on the previous draft.

8. PUBLICATIONS NOTE

RES encourages the publication of the scientific results from RES sponsored programs in refereed scientific and engineering journals as appropriate. If the contractor 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 COR. The RES COR shall either approve the material as submitted, approve it subject to NRC suggested revisions, or disapprove it. In any event, the RES COR 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 COR determines that it will benefit the RES project, the COR may authorize payment of travel and publishing costs, if any, from the project funds. If the COR 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 COR in both electronic and camera-ready copy.

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 COR 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
Microsoft®Word®
Microsoft® PowerPoint®
Microsoft®Excel
Microsoft®Access
Portable Document Format

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.

9. REQUIRED LABOR CATEGORIES

The NRC will rely on representations made by the contractor concerning the qualifications of the personnel proposed for this task order, including assurance that information contained in the technical and cost proposals, including resumes, is accurate and truthful. The resume for each professional proposed to work under this task order (contractor, subcontractor, or consultant) shall describe the individual's experience in applying his or her area of engineering specialization to work in the proposed area.

The Contractor must provide individuals who have the required educational background and work experience to meet the objectives of the work specified in this task order. Specific qualifications for this effort include: a) expertise in the use of the MELCOR computer code, models, correlations, and code experimental assessment studies; b) expertise in Design Basis Accident and Beyond Design Basis Accident analyses, and NRC regulations pertaining to those analyses; c) familiarity of the response of advanced reactors (APR1400 and SMRs) to severe accidents and accident progression; d) expertise and experience in analysis of nuclear reactor thermal-hydraulics; e) familiarity with requests for additional information (RAI) development.

10. GOVERNMENT-FURNISHED PROPERTY

The NRC will provide to the contractor information and design data and any available input data that is provided by the applicant. Proprietary submitted documentation will be provided by the

NRC in the form of CD-ROMs, or as an encrypted email attachment. Deliverables produced will become property of the NRC.

The contractor shall be responsible for the protection of NRC documentation in its possession during the course of contract performance in accordance with the procedures as set forth in NRC's policy entitled, Sensitive Unclassified Non-Safeguards Information (SUNSI), Handling Requirements for Proprietary Information.

11. PLACE OF PERFORMANCE

COR may request certain work be performed at an NRC site, or request the presence of contractor staff during public ACRS, ASLB, or other meetings or workshops.

12. SPECIAL CONSIDERATIONS

12.1 TRAVEL/MEETINGS

In addition to the kick-off meeting, additional meetings will be held as needed either in person at NRC facilities or by teleconference.

Task 1 may require kick-off meetings, outlined by Task 0, at the request of the NRC to discuss a plan of action, logistics, and provide feedback, information, and staff clarifications to complete the items presented in the Statement of Work. The timing of these meetings, if necessary, is to be determined.

Task 3 will require travel to NRC or Applicants Offices to assist in the NRC's audit efforts. The timing of these meetings, if necessary, is to be determined. Specifically, the planned audits require:

- Subtask 3.1: Two audits of three days in duration either at the NRC Headquarters or at the Applicant's Virginia Offices are anticipated.
- Subtask 3.2: Two audits of three days in duration either at the NRC Headquarters or at the Applicant's Oregon Offices are anticipated.

Travel requires prior written approval from the COR.

12.2 SECURITY

Work on this task order may involve the handling of documents that contain proprietary information. The contractor shall safeguard documents containing proprietary information against unauthorized disclosure. After completion of work, the contractor must either destroy the documents or return them to the NRC. If they are destroyed, please confirm this in an e-mail to the COR with a copy to the CO and include the date and manner in which the documents were destroyed.

12.3 LICENSE FEE RECOVERY

Most of the work performed on Subtasks involving the APR1400 will be License Fee Recoverable. It is not expected that Subtasks involving NuScale will be License Fee Recoverable.

SECTION D - Packaging and Marking

NRCD010 PACKAGING AND MARKING

(a) The Contractor shall package material for shipment to the NRC in such a manner that will ensure acceptance by common carrier and safe delivery at destination. Containers and closures shall comply with the Surface Transportation Board, Uniform Freight Classification Rules, or regulations of other carriers as applicable to the mode of transportation.

(b) On the front of the package, the Contractor shall clearly identify the contract number under which the product is being provided.

(c) Additional packaging and/or marking requirements are as follows: None.

NRCD020 BRANDING

The Contractor is required to use the statement below in any publications, presentations, articles, products, or materials funded under this contract/order, to the extent practical, in order to provide NRC with recognition for its involvement in and contribution to the project. If the work performed is funded entirely with NRC funds, then the contractor must acknowledge that information in its documentation/presentation.

Work Supported by the U.S. Nuclear Regulatory Commission (NRC), Office of Nuclear Regulatory Research, under Contract/order number NRC-HQ-25-14-E-0002/
NRC-HQ-60-15-T-0001.

SECTION E - Inspection and Acceptance

CONTRACTING OFFICER'S REPRESENTATIVE

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

Name: Alfred Hathaway
Address: Mail Stop: TWFN 10D74
Washington, DC 20555

Telephone Number: 301-415-2461

(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 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 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 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 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 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.

SECTION F - Deliveries or Performance

NRCF010 PLACE OF DELIVERY-REPORTS

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

- a. Name: Alfred Hathaway (1 Electronic Copy)
- b. Contracting Officer's Representative (COR)
- c. Address: Alfred.Hathaway@nrc.gov (1 Electronic Copy)

- d. Name: Hugo Alcantara (1 Electronic Copy)
- e. Contract Specialist (CS)
- f. Address: Hugo.Alcantara@nrc.gov (1 Electronic Copy)

NRCF032 TASK/DELIVERY ORDER PERIOD OF PERFORMANCE (SEP 2013)

This order shall commence on June 30, 2015 and will expire on September 29, 2019.

DELIVERABLES AND DELIVERY SCHEDULE

Task No.	Deliverable/Description	Quantity/Media	Due Date
Task 0	Physical briefing at NRC HQ	N/A	1 week after contract award
SUBTASK 1.1	TBD (Deliverables may include updated MELCOR models, updated calculation notebooks, slides, physical briefings at NRC HQ, etc.)	N/A	TBD
SUBTASK 1.2	MELCOR calculation report for test facilities MELCOR input decks	N/A	5 months
SUBTASK 1.3	Letter report documenting results of MELCOR experimental benchmarking studies, and summarizing insights and modeling recommendations	N/A	4 months after completion of SUBTASK 1.2
SUBTASK 2.1	Letter report or memorandum describing analyses performed	N/A	TBD after exercising option
SUBTASK 2.2	Letter report or memorandum describing analyses performed	N/A	TBD after exercising option
SUBTASK 2.3	Updated Input Model Updated Calculation Notebook Letter Report documenting results of the confirmatory assessment	N/A	TBD by NRC consistent with NRO review schedule, but 6 months after receipt of updated design data and completion of SUBTASK 1.3
SUBTASK 3.1	Pre-audit formulation of issues to be incorporated into the NRC's audit plan Post-audit report summarizing the findings, conclusions, and recommendations	N/A	TBD by NRC consistent with NRO review schedule

SUBTASK 3.2	Pre-audit formulation of issues to be incorporated into the NRC's audit plan Post-audit report summarizing the findings, conclusions, and recommendations	N/A	TBD by NRC consistent with NRO review schedule
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SECTION G - Contract Administration Data

NRCG030 ELECTRONIC PAYMENT (SEP 2014)

The Debt Collection Improvement Act of 1996 requires that all payments except IRS tax refunds be made by Electronic Funds Transfer. Payment shall be made in accordance with FAR 52.232-33, entitled "Payment by Electronic Funds-System for Award Management".

To receive payment, the contractor shall prepare invoices in accordance with NRC's Billing Instructions. Claims shall be submitted on the payee's letterhead, invoice, or on the Government's Standard Form 1034, "Public Voucher for Purchases and Services Other than Personal," and Standard Form 1035, "Public Voucher for Purchases Other than Personal – Continuation Sheet." The preferred method of submitting invoices is electronically to: NRCPayments@nrc.gov.

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:

<u>Name</u>	<u>Title</u>
Dr. M. Khatib-Rahbar	Project Manager
Dr. Z. Yuan	MELCOR Analyst
Dr. A. Krall	MELCOR Analyst
Mr. M. Zavisca	MELCOR Analyst

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.

2052.215-78 TRAVEL APPROVALS AND REIMBURSEMENT (OCT 1999) - ALTERNATE I (OCT 1999)

(a) Total expenditure for travel may not exceed **\$12,500.00** 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 travel costs incurred that are directly related to this contract and 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, must 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.

NRCH400 SECURITY REQUIREMENTS RELATING TO THE PRODUCTION OF REPORT(S) OR THE PUBLICATION OF RESULTS UNDER CONTRACTS, AGREEMENTS, AND GRANTS

Review and Approval of Reports

(a) Reporting Requirements. The contractor/grantee shall comply with the terms and conditions of the contract/grant regarding the contents of the draft and final report, summaries, data, and related documents, to include correcting, deleting, editing, revising, modifying, formatting, and supplementing any of the information contained therein, at no additional cost to the NRC. Performance under the contract/grant will not be deemed accepted or completed until it complies with the NRC's directions. The reports, summaries, data, and related documents will be considered draft until approved by the NRC. The contractor/grantee agrees that the direction, determinations, and decisions on approval or disapproval of reports, summaries, data, and related documents created under this contract/grant remain solely within the discretion of the NRC.

(b) Publication of Results. Prior to any dissemination, display, publication, or release of articles, reports, summaries, data, or related documents developed under the contract/grant, the contractor/grantee shall submit them to the NRC for review and approval. The contractor/grantee shall not release, disseminate, display or publish articles, reports, summaries, data, and related documents, or the contents therein, that have not been reviewed and approved by the NRC for release, display, dissemination or publication. The contractor/grantee agrees to conspicuously place any disclaimers, markings or notices, directed by the NRC, on any articles, reports, summaries, data, and related documents that the contractor/grantee intends to release, display, disseminate or publish to other persons, the public, or any other entities. The contractor/grantee agrees, and grants, a royalty-free, nonexclusive, irrevocable worldwide license to the government, to use, reproduce, modify, distribute, prepare derivative works, release, display or disclose the articles, reports, summaries, data, and related documents developed under the contract/grant, for any governmental purpose and to have or authorize others to do so.

(c) Identification/Marking of Sensitive Unclassified Non-Safeguards Information (SUNSI) and Safeguards Information (SGI). The decision, determination, or direction by the NRC that information possessed, formulated or produced by the contractor/grantee constitutes SUNSI or SGI is solely within the authority and discretion of the NRC. In performing the contract/grant, the

contractor/grantee shall clearly mark SUNSI and SGI, to include for example, OUO-Allegation Information or OUO-Security Related Information on any reports, documents, designs, data, materials, and written information, as directed by the NRC. In addition to marking the information as directed by the NRC, the contractor shall use the applicable NRC cover sheet (e.g., NRC Form 461 Safeguards Information) in maintaining these records and documents. The contractor/grantee shall ensure that SUNSI and SGI is handled, maintained and protected from unauthorized disclosure, consistent with NRC policies and directions. The contractor/grantee shall comply with the requirements to mark, maintain, and protect all information, including documents, summaries, reports, data, designs, and materials in accordance with the provisions of Section 147 of the Atomic Energy Act of 1954 as amended, its implementing regulations (10 CFR 73.21), Sensitive Unclassified Non-Safeguards and Safeguards Information policies, and NRC Management Directives and Handbooks 12.5, 12.6 and 12.7.

(d) Remedies. In addition to any civil, criminal, and contractual remedies available under the applicable laws and regulations, failure to comply with the above provisions, and/or NRC directions, may result in suspension, withholding, or offsetting of any payments invoiced or claimed by the contractor/grantee.

(e) Flowdown. If the contractor/grantee intends to enter into any subcontracts or other agreements to perform this contract/grant, the contractor/grantee shall include all of the above provisions in any subcontracts or agreements.

NRCH410 WHISTLEBLOWER PROTECTION FOR NRC CONTRACTOR AND SUBCONTRACTOR EMPLOYEES

(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 entitled: "Your Rights Under the Energy Reorganization Act".

(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.

NRCH470 GREEN PURCHASING (SEP 2013)

(a) In furtherance of the sustainable acquisition goals included in Executive Order 13514, "Federal Leadership in Environmental, Energy, and Economic Performance," products and services acquired under this contract/order shall be energy-efficient (Energy Star or Federal

Energy Management Program (FEMP) designated), water-efficient, biobased, environmentally preferable (e.g., Electronic Product Environmental Assessment Tool (EPEAT) certified), non-ozone depleting, recycled content, and non-toxic or less toxic alternatives, to the maximum extent practicable in meeting NRC contractual requirements.

(b) See NRC's Green Purchasing Plan (GPP) at:
<http://pbadupws.nrc.gov/docs/ML1219/ML12191A130.pdf> and the General Service

Administration's (GSA) Green Procurement Compilation at:
<http://www.gsa.gov/portal/content/198257>.

(c) The contractor shall flow down this clause into all subcontracts and other agreements that relate to performance of this contract/order.

NRCH480 USE OF AUTOMATED CLEARING HOUSE (ACH) ELECTRONIC PAYMENT/REMITTANCE ADDRESS

The Debt Collection Improvement Act of 1996 requires that all Federal payments except IRS tax refunds be made by Electronic Funds Transfer. It is the policy of the Nuclear Regulatory Commission to pay government vendors by the Automated Clearing House (ACH) electronic funds transfer payment system. Item 15C of the Standard Form 33 may be disregarded.

SECTION I - Contract Clauses

52.217-8 OPTION TO EXTEND SERVICES (NOV 1999)

The Government may require continued performance of any services within the limits and at the rates specified in the contract. These rates may be adjusted only as a result of revisions to prevailing labor rates provided by the Secretary of Labor. The option provision may be exercised more than once, but the total extension of performance hereunder shall not exceed 6 months. The Contracting Officer may exercise the option by written notice to the Contractor within 15 days.

(End of clause)

SECTION J - List of Documents, Exhibits and Other Attachments

<u>Attachment No.</u>	<u>Description</u>
1.	Billing Instructions for Cost-Reimbursement Type Contracts