AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT D CODE	PAGE OF PAGES
	1 17

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. *(If applicable)*
P00008	See Block 16C	NMSS-21-0043	

6. ISSUED BY CODE NRCHQ

US NRC - HQ
ACQUISITION MANAGEMENT DIVISION
MAIL STOP TWFN-07B20M
WASHINGTON DC 20555-0001

7. ADMINISTERED BY *(If other than Item 6)* CODE

8. NAME AND ADDRESS OF CONTRACTOR *(No., street, county, State and ZIP Code)*

SOUTHWEST RESEARCH INSTITUTE
ATTN PAUL MALDONADO
6220 CULEBRA RD
SAN ANTONIO TX 782385166

CODE 007936842 FAC LITY CODE

(x) 9A. AMENDMENT OF SOLICITATION NO.

9B. DATED *(SEE ITEM 11)*

X 10A. MODIFICATION OF CONTRACT/ORDER NO.
31310018D0001
31310018F0113

10B. DATED *(SEE ITEM 13)*
09/25/2018

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended ☐ is not extended.
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended , by one of the following methods: (a) By completing tems 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted ; or (c) By separate letter or electronic communication which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted , such change may be made by letter or electronic communication, provided each letter or electronic communication makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNT NG AND APPROPRIATION DATA *(If required)* Net Increase: $75,000.00
2021-X0200-ADVRX-50-50D007-1061-1A-6-220-255B-1A-6-220-1061

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

CHECK ONE	
	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIF ED TO REFLECT THE ADM NISTRATIVE CHANGES *(such as changes in paying office, appropriation data, etc.)* SET FORTH N ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	D. OTHER *(Specify type of modification and authority)* FAR 52.243-2 CHANGES - COST-REIMBURSEMENT (AUG 1987) - ALT I (APR 1984)

E. IMPORTANT Contractor ☐ is not ☒ is required to sign this document and return 1 copies to the issuing office.

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

PLEASE SEE PAGE TWO (2) FOR MODIFICATION TO: 1) PROVIDE INCREMENTAL FUNDING IN THE AMOUNT OF $75,000.00; AND 2) REVISE THE STATEMENT OF WORK, AT NO ADDITIONAL COST.

Task Order Obligation Amount: $759,000.00 (Changed)
Task Order Exercised Amount: [redacted]
Task Order Base and All Options: $1,286,357.00 (Unchanged)
Period of Performance: 09/28/2018 to 09/30/2021

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

15A. NAME AND TITLE OF SIGNER *(Type or print)*		16A. NAME AND TITLE OF CONTRACT NG OFFICER *(Type or print)*	
		JENNIFER A. DUDEK	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
(Signature of person authorized to sign)		[redacted] *(Signature of Contracting Officer)*	03/09/2021

Previous edition unusable

STANDARD FORM 30 (REV. 11/2016)
Prescribed by GSA FAR (48 CFR) 53.243

The purpose of this task order modification is to:

1) Provide incremental funding in the amount of $75,000.00, thereby increasing the obligated amount from $684,000.00 to $759,000.00.
2) Revise the statement of work, at no cost impact, to add in the following tasks:
   - 3.1.d. Subtask 4 – Evaluate Current Regulatory Guidance and Identify Gaps for Applicability of Guidance to Transportation of Fresh (Unirradiated) ARF Types;
   - 3.2.d. Subtask 4 – Evaluate Current Regulatory Guidance and Identify Gaps for Applicability of Guidance to Storage of Spent (Irradiated) ARF Types; and
   - 3.3.d. Subtask 4 – Evaluate Current Regulatory Guidance and Identify Gaps for Applicability of Guidance to Transportation of Spent (Irradiated) ARF Types.

Accordingly, the task order is hereby modified as follows:

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

> "(c) The amount presently obligated with respect to this order is **$759,000.00** of which [redacted] represents costs and [redacted] represents fixed-fee. The obligated amount shall, at no time, exceed the order ceiling as specified in paragraph (a) above. When and if the amount(s) paid and payable to the Contractor hereunder shall equal the obligated amount, the Contractor shall not be obligated to continue performance of the work unless and until the Contracting Officer shall increase the amount obligated with respect to this order, in accordance with FAR Part 43 - Modifications. Any work undertaken by the Contractor in excess of the obligated amount specified above is done so at the Contractor's sole risk and may not be reimbursed by the Government."

2) **SECTION C – Statement of Work** is deleted in its entirety and replaced with Attachment 1.

All other terms and conditions of this task order remain unchanged.

SECTION C –Statement of Work

PROJECT TITLE: TECHNICAL ASSISTANCE FOR THE REVIEW OF THE STORAGE, TRANSPORTATION, AND DISPOSAL OF ADVANCED REACTOR FUEL TYPES

1.0 BACKGROUND

As the U.S. Nuclear Regulatory Commission (NRC) prepares to review and regulate non-light water reactors fuel , the NRC staff needs to have an understanding of the potential challenges associated with the storage, transportation, and disposal of ARF types to be prepared to undertake appropriate regulatory actions (e.g., revisions to guidance documents and regulations). A potential challenge is the technology for providing canisters and casks to be used for long-term storage, transportation, and disposal of the waste from these new fuel types such as metal fuel, TRISO pebbles, and molten salt.

A primary question is understanding the compatibility of current approaches and technology for storing, transporting, and disposing of the ARF types, including the high-level waste resulting from the use of ARF types. For example, the NRC is interested in examining whether the chemical and physical characteristics of the waste form increase or create new degradation processes for the containers used to store, transport, and dispose of the ARF types and potential waste forms.

The Center for Nuclear Waste Regulatory Analyses (CNWRA) has assisted NRC staff in a wide range of technical areas supporting the development of regulations and guidance documents related to the storage, transportation and geological disposal of radioactive materials, including, but not limited to chemical engineering, geochemistry, material science, and environmental. CNWRA staff have assisted in both regulatory reviews and support the development of regulatory bases and guidance documents.

2.0 OBJECTIVE

The overall objective of this task order is to seek technical expertise from the CNWRA to assist the NRC identify and assess the significance of potential challenges associated the safe storage, transportation, and disposal of advanced reactor waste. For existing LWRs, the NRC prepared an EIS that examined the consequences of long-term storage of LWR fuel. The analysis specifically did not include advance reactor waste. The EIS said there would be new analysis for advanced reactor waste. This type of information will be helpful in assessing potential challenges that may need to be addressed in any applicant’s plans for long-term storage, transportation, and disposal of ARF fuel types and the associated high-level waste.

For the purpose of this task order, the specific areas for the technical assistance, as listed below, are defined as four (4) separate task areas under Section 3.0 – SCOPE OF WORK AND DELIVERABLES:

- Task Area 1 – Transportation of Fresh (Unirradiated) ARF types
- Task Area 2 – Storage of Spent (Irradiated) ARF types and associated high-level waste
- Task Area 3 – Transportation of Spent (Irradiated) ARF types and associated high-level waste
- Task Areas 4 – Disposal of Spent (irradiated) ARF types and associated high-level waste

3.0 SCOPE OF WORK AND DELIVERABLES

3.1 TASK AREA 1 – TRANSPORTATION OF FRESH (UNIRRADIATED) ARF TYPES

Technical assistance required under this Task Area 1 is identified as subtasks below and are driven by NRC's activities and priorities. The initial estimate of the Level of Effort for each subtask is based upon the NRC's current priorities and activities. However, it may be necessary to increase or decrease the scope of work for several subtasks at one time, if priorities or activities change because this will be dependent on the ARF types being proposed. As conditions warrant, NRC COR may provide revised technical direction to CNWRA and adjust the scope of each Task Area. Changes such as this will be made by bilateral modification to this task order. An integrated schedule which includes all deliverables for these subtasks is presented in Appendix A. The travel associated with each subtask is summarized in Section 5.0 – MEETINGS AND TRAVEL of this task order.

3.1.a Subtask 1 - Literature Review of Transportation Experience with Fresh ARF Types

The CNWRA shall collect and review current information regarding experience with transportation of fresh (unirradiated) ARF types (e.g., metal fuel, HTGR fuel, molten salt fuel). The review will consider both domestic and international experience. Available information on the nature of the fuel, the transportation experience (e.g., any degradation of the fuel) will be collected and the experience summarized. The review will identify degradation mechanisms observed as well as ones postulated but possibly not observed because of limited operational experience.

The technical assistance provided to the NRC on this subtask should be documented in a single deliverable. (See Appendix A for the description of deliverables and the scheduled dates).

3.1.b Subtask 2 – Identification of Potential Challenges with Transportation of Fresh (Unirradiated) ARF Types

The CNWRA shall assess the potential challenges for transportation of fresh (unirradiated) ARF types, with a focus on the compatibility of current approaches and technology used for transporting fresh (unirradiated) LWR fuels. Primary considerations are whether there are important degradation processes and whether current transportation package materials and designs are available to allow transport in compliance with the requirements in 10 CFR Part 71.

The technical assistance provided to the NRC on this subtask will be documented in a single deliverable associated with each fuel type identified by the NRC TPM. (See Appendix B for the description of deliverables and the scheduled dates).

3.1.c Subtask 3 – Identification of Potential Information Needs Associated with Transportation of Fresh (Unirradiated) ARF Types

The CNWRA shall identify information needs associated with the evaluation of the safety of materials and designs used for transportation of fresh (unirradiated) ARF types. The identification shall include the materials and designs that may be used to address new degradation mechanisms, including the development of revised procedures for loading transportation packages.

This subtask will be initiated at the direction of the NRC COR. Should this subtask be initiated the NRC will request a letter report stated in Task 1 Schedule and Deliverables.

3.1.d Subtask 4 – Evaluate Current Regulatory Guidance and Identify Gaps for Applicability of Guidance to Transportation of Fresh (Unirradiated) ARF Types

The goal of this subtask is to identify the applicability of regulatory guidance, particularly Standard Review Plans (SRPs), and to identify gaps in SRP guidance and/or areas where applicability of the guidance needs further technical analysis for transportation of fresh TRISO and metallic fuel for non-LWRs. For example, the technologies to be considered should include TRISO fuel for the X-Energy High Temperature Gas Cooled Reactor and metallic fuel for the Terrapower sodium-cooled fast reactor. The contractor shall evaluate the SRP (i.e., NUREG-2216) and other relevant regulatory guidance for transportation considering the phenomena and degradation mechanisms important to safety, as well as the conclusions reported from Task 3.1.a through 3.1.c. Furthermore, the contractor shall take into consideration current or alternative licensing and certification approaches, and, if applicable, shall define information needs or technical analyses needed to address gaps in regulatory guidance for reviews of transportation casks containing fresh TRISO and metallic fuel.

The technical assistance provided to the NRC on this subtask should be documented in two separate deliverables. The first deliverable shall be a decision-making tool following the structure of the standard review plan (e.g., a table summarizing the contractor's finding or a graphical tool such as a flow chart) identifying the applicability of current SRP guidance and/or

preliminary gaps identified. The second deliverable shall document, in a technical report, the above-mentioned applicability and gap findings regarding regulatory and technical reviews and, if applicable, shall define information needs or technical analysis needed to address gaps in regulatory guidance. The second deliverable should be combined, in a single technical report, with the results from Tasks 3.2.d and 3.3.d.

3.1.e Task 1 Schedule and Deliverables (Appendix A)

APPENDIX A

TASK 1 SCHEDULE AND DELIVERABLES

DELIVERABLE	DESCRIPTION	SCHEDULE
1	One letter report (5 -10 pages) which summarizes the results of subtask 1.	Deliverable due 1 months after initiation of Task 1.
2	One letter report (5 -10 pages) which summarizes the results of subtask 2.	Deliverable due 2 months after initiation of Task 1.
3	One letter report (5 -10 pages) which summarizes the results of subtask 3.	Deliverable and schedule will be provided if and when this subtask is initiated by the COR.
4	One decision-making tool following SRP structure (subtask 4)	Deliverable due 2 months after initiation of subtask 4.
5	One technical report which summarizes the results of subtask 4 (combined in one single report with the results from Tasks 3.2.d and 3.3.d).	Deliverable due 4 months after initiation of subtask 4
6	Letter Report – Draft Periodic Monitoring Report (PMR).	Deliverable and schedule will be provided if and when this subtask is initiated by the COR.

3.2 TASK AREA 2 – STORAGE OF SPENT (IRRADIATED) ARF TYPES

Technical assistance required under this Task Area 2 is identified as subtasks below and are driven by NRC's activities and priorities. The initial estimate of the Level of Effort for each subtask is based upon the NRC's current priorities and activities. However, it may be necessary to increase or decrease the scope of work for several subtasks at one time, if priorities or activities change because this will be dependent on the ARF types being proposed. As conditions warrant, NRC COR may provide revised technical direction to CNWRA and adjust the scope of each Task Area. Changes such as this will be made by bilateral modification to this task order. An integrated schedule which includes all deliverables for these subtasks is presented in Appendix A. The travel associated with each subtask is summarized in Section 5.0 – MEETINGS AND TRAVEL of this task order.

3.2.a Subtask 1 - Literature Review of Storage Experience with ARF Types

The CNWRA shall collect and review current information regarding experience with storage of irradiated fuel material (e.g., metal fuel, HTGR fuel, irradiated molten salt fuel). The review will consider both domestic and international experience. Available information on the nature of the fuel, the storage conditions and storage experience (e.g. any degradation of the fuel) will be collected and the experience summarized. The review will identify degradation mechanism observed as well as ones postulated but possibly not observed because of limited operational experience.

The technical assistance provided to the NRC on this subtask should be documented in a single deliverable. (See Appendix B for the description of deliverables and the scheduled dates).

3.2.b Subtask 2 – Identification of Potential Challenges with Storage of Spent (Unirradiated) ARF Types

The CNWRA shall assess the technical potential for long-term storage of the ARF types, with a focus on the compatibility of current approaches and technology used to stored light-water reactor waste. Primary considerations are whether there are important degradation process (e.g., radiolysis that leads to high pressure) and whether current canister materials and designs are available to contain the material for anticipated storage periods.

The technical assistance provided to the NRC on this subtask will be documented in a single deliverable that addresses the advance reactor waste identified by the NRC TPM. (See Appendix B for the description of deliverables and the scheduled dates).

3.2.c Subtask 3 – Identification of Information Needs Associated with Storage of Spent (Irradiated) ARF Types

The CNWRA shall identify information needs associated with the evaluation of the safety of materials and designs that may be used for storage. The identification shall include the

materials and designs that may be used to address new degradation mechanisms, including the development of revised procedures for loading storage containers.

This subtask will be initiated at the direction of the NRC COR. Should this subtask be initiated the NRC will request a letter report stated in Task 2 Schedule and Deliverables.

3.2.d Subtask 4 – Evaluate Current Regulatory Guidance and Identify Gaps for Applicability of Guidance to Storage of Spent (Irradiated) ARF Types

The goal of this subtask is to identify the applicability of regulatory guidance, particularly Standard Review Plans (SRPs), and to identify gaps on SRP guidance and/or areas where applicability of the guidance needs further technical analysis for storage of TRISO and metallic fuel for non-LWRs. For example, the technologies to be considered should include TRISO fuel for the X-Energy High Temperature Gas Cooled Reactor and metallic fuel for the Terrapower sodium-cooled fast reactor. The contractor shall evaluate the SRP (i.e., NUREG-2215) and other relevant regulatory guidance for storage considering the phenomena and degradation mechanisms important to safety, as well as the conclusions reported from Task 3.2.a through 3.2.c. Furthermore, the contractor shall take into consideration current or alternative licensing and certification approaches, and, if applicable, shall define information needs or technical analyses needed to address gaps in regulatory guidance for reviews of storage casks containing used TRISO and metallic fuel.

The technical assistance provided to the NRC on this subtask should be documented in two separate deliverables. The first deliverable shall be a decision-making tool following the structure of the standard review plan (e.g., a table summarizing the contractor's finding or a graphical tool such as a flow chart) identifying the applicability of current SRP guidance and/or preliminary gaps identified. The second deliverable shall document, in a technical report, the above-mentioned applicability and gap findings regarding regulatory and technical reviews and, if applicable, shall define information needs or technical analysis needed to address gaps in regulatory guidance. The second deliverable should be combined, in a single technical report, with the results from Tasks 3.1.d and 3.3.d.

3.2.e Task 2 Schedule and Deliverables (Appendix B)

APPENDIX B

DELIVERABLE	DESCRIPTION	SCHEDULE
1	One letter report (10-15 pages) which summarizes the results of subtask 1.	Deliverable due 3 months after the initiation of Task 2.
2		

	One letter report (10-15 pages) which summarizes the results of subtask 2.	Deliverable due 2 months after the completion of subtask 1 of Task 2.
3	No individual deliverable expected, but results obtained from subtask 3.2.c should be included in the report for subtask 3.2.d.	N/A
4	One decision-making tool following SRP structure	Deliverable due 2 months after initiation of subtask 4.
5	One technical report which summarizes the results of subtask 4 (combined, in a single technical report, with the second deliverable from Tasks 3.1.d and 3.3.d).	Deliverable due 4 months after initiation of subtask 4
6	Letter Report – Draft Periodic Monitoring Report (PMR).	Deliverable schedule will be provided if and when this subtask is initiated by the COR.

3.3 TASK AREA 3 – TRANSPORTATION OF SPENT (IRRADIATED) ARF TYPES

Technical assistance required under this Task Area 3 is identified as subtasks below and are driven by NRC's activities and priorities. The initial estimate of the Level of Effort for each subtask is based upon the NRC's current priorities and activities. However, it may be necessary to increase or decrease the scope of work for several subtasks at one time, if priorities or activities change because this will be dependent on the ARF types being proposed. As conditions warrant, NRC COR may provide revised technical direction to CNWRA and adjust the scope of each Task Area. Changes such as this will be made by bilateral modification to this task order. An integrated schedule which includes all deliverables for these subtasks is presented in Appendix C. The travel associated with each subtask is summarized in Section 5.0 – MEETINGS AND TRAVEL of this task order.

3.3.a Subtask 1 - Literature Review of Transportation Experience with ARF Types

The CNWRA shall collect and review current information regarding experience with transportation of irradiated fuel material (e.g., metal fuel, HTGR fuel, irradiated molten salt fuel). The review will consider both domestic and international experience. Available information on the nature of the fuel, the transportation experience (e.g. any degradation of the fuel) will be

collected and the experience summarized. The review will identify degradation mechanism observed as well as ones postulated but possibly not observed because of limited operational experience.

The technical assistance provided to the NRC on this subtask should be documented in a single deliverable. (See Appendix C for the description of deliverables and the scheduled dates).

3.3.b Subtask 2 – Identification of Potential Challenges with Transportation of Spent (Irradiated) ARF Types

The CNWRA shall assess the potential challenges for transportation of the ARF types, with a focus on the compatibility of current approaches and technology used for transporting LWR spent fuel. Primary considerations are whether there are important degradation processes and whether current transportation package materials and designs are available to contain the material consistent with the requirements at 10 CFR Part 71.

The technical assistance provided to the NRC on this subtask will be documented in a single deliverable associated with each fuel type identified by the NRC TPM. (See Appendix C for the description of deliverables and the scheduled dates).

3.3.c Subtask 3 – Identification of Potential Information Needs Associated with Transportation of Spent (Irradiated) ARF Types

The CNWRA shall identify information needs associated with the evaluation of the safety of materials and designs that may be used for transportation of ARF types. The identification shall include the materials and designs that may be used to address new degradation mechanisms, including the development of revised procedures for loading transportation casks.

This subtask will be initiated at the direction of the NRC COR. Should this subtask be initiated the NRC will request a letter report stated in Task 3 Schedule and Deliverables.

3.3.d Subtask 4 – Evaluate Current Regulatory Guidance and Identify Gaps for Applicability of Guidance to Transportation of Spent (Irradiated) ARF Types

The goal of this subtask is to identify the applicability of regulatory guidance, particularly Standard Review Plans (SRPs), and to identify gaps on SRP guidance and/or areas where applicability of the guidance needs further technical analysis for transportation of spent TRISO and metallic fuel for non-LWRs. For example, the technologies to be considered should include TRISO fuel for the X-Energy High Temperature Gas Cooled Reactor and metallic fuel for the Terrapower sodium-cooled fast reactor. The contractor shall evaluate the SRP (i.e., NUREG-2216) and other relevant regulatory guidance for transportation considering the phenomena and degradation mechanisms important to safety, as well as the conclusions reported from Task

3.3.a through 3.3.c. Furthermore, the contractor shall take into consideration current or alternative licensing and certification approaches, and, if applicable, shall define information needs or technical analyses needed to address gaps in regulatory guidance for reviews of transportation casks containing spent TRISO and metallic fuel.

The technical assistance provided to the NRC on this subtask should be documented in two separate deliverables. The first deliverable shall be a decision-making tool following the structure of the standard review plan (e.g., a table summarizing the contractor's finding or a graphical tool such as a flow chart) identifying the applicability of current SRP guidance and/or preliminary gaps identified. The second deliverable shall document, in a technical report, the above-mentioned applicability and gap findings regarding regulatory and technical reviews and, if applicable, shall define information needs or technical analysis needed to address gaps in regulatory guidance. The second deliverable should be combined, in a single technical report, with the results from Tasks 3.1.d and 3.2.d.

3.3.e Task 3 Schedule and Deliverables (Appendix C)

APPENDIX C

TASK 3 SCHEDULE AND DELIVERABLES

DELIVERABLE	DESCRIPTION	SCHEDULE
1	One letter report (5 - 10 pages) which summarizes the results of subtask 1.	Deliverable due 2 months after the initiation of Task 3.
2	One letter report (5 -10 pages) which summarizes the results of subtask 2.	Deliverable due 2 months after the completion of Subtask 1 of Task 3.
3	No individual deliverable expected, but results obtained from subtask 3.3.c should be included in the report for subtask 3.3.d	N/A
4	One decision-making tool following SRP structure (subtask 4)	Deliverable due 2 months after initiation of subtask 4.
5	One technical report which summarizes the results of subtask 4 (combined, in a	Deliverable due 4 months after initiation of subtask 4

	single technical report, with the second deliverable from Tasks 3.1.d and 3.2.d).	
6	Letter Report – Draft Periodic Monitoring Report (PMR).	Deliverable schedule will be provided if and when this subtask is initiated by the COR.

3.4 TASK AREA 4 – DISPOSAL OF ARF TYPES

Technical assistance required under this Task Area 4 is identified as subtasks below and are driven by NRC's activities and priorities. The initial estimate of the Level of Effort for each subtask is based upon the NRC's current priorities and activities. However, it may be necessary to increase or decrease the scope of work for several subtasks, if priorities or activities change because this will be dependent on the ARF types being proposed. As conditions warrant, NRC COR may provide revised technical direction to CNWRA and adjust the scope of each Task Area. Changes such as this will be made by bilateral modification to this task order. An integrated schedule which includes all deliverables for these subtasks is presented in Appendix D. The travel associated with each subtask is summarized in Section 5.0 – MEETINGS AND TRAVEL of this task order.

3.4.a Subtask 1 - Literature Review of Disposal Experience with ARF Types

The CNWRA shall collect and review current information regarding experience with disposal of irradiated fuel material (e.g., metal fuel, HTGR fuel, irradiated molten salt fuel). The review will consider both domestic and international experience. Available information on the nature of the fuel, the disposal experience (e.g. any degradation of the fuel or waste package) will be collected and the experience summarized. The review will identify degradation mechanisms observed as well as ones postulated but possibly not observed because of limited operational experience.

The technical assistance provided to the NRC on this subtask should be documented in a single deliverable. (See Appendix D for the description of deliverables and the scheduled dates).

3.4.b Subtask 2 – Identification of Potential Challenges to a Waste Package and Waste Form Used for Disposal of ARF Types

The CNWRA shall assess the potential challenges for disposal of ARF types, with a focus on the compatibility of current approaches and technology used for a waste package used for geological disposal. Primary considerations are whether there are important degradation process and whether current canister materials, waste forms, and designs are available for use

in a geological repository. This effort should make use of the results from Tasks 1 thru 3 to the maximum extent possible.

The technical assistance provided to the NRC on this subtask will be documented in a single deliverable that addresses the advance reactor waste identified by the NRC COR. (See Appendix D for the description of deliverables and the scheduled dates).

3.4.c Subtask 3 – Identification of Potential Challenges to Site Performance for Disposal of ARF Types

The CNWRA shall assess the potential challenges for disposal of ARF types, with a focus on the behavior (i.e., solubility and transport) of radionuclides in the geologic environments. Primary considerations are whether there are important geochemical processes that have not previously been considered in the context of radioactive waste disposal.

The technical assistance provided to the NRC on this subtask will be documented in a single deliverable that addresses the advance reactor waste identified by the NRC COR. (See Appendix D for the description of deliverables and the scheduled dates).

3.4.d Subtask 4 – Identification of Information Needs Associated with Disposal of ARF Types

The CNWRA shall identify information needs associated evaluation of the safety of materials and designs that may be used for disposal. The identification shall include the materials and designs that may be used to address waste form degradation mechanisms and geochemical conditions impacting radionuclide release from repository drifts.

This subtask will be initiated at the direction of the NRC COR. Should this subtask be initiated the NRC will request a letter report stated in Task 4 Schedule and Deliverables.

3.4.e Task 4 Schedule and Deliverables (Appendix D)

APPENDIX D

TASK 4 SCHEDULE AND DELIVERABLES

DELIVERABLE	DESCRIPTION	SCHEDULE
1	One letter report (1-5 pages) which summarizes the results of subtask 1.	Deliverable due 1 month after the initiation of Task 4.

2	One letter report (1-5 pages) which summarizes the results of subtask 1.	Deliverable due 2 months after the initiation of Task 4.
3	One letter report (1-5 pages) which summarizes the results of subtask 2.	Deliverable due 1 months after the completion of subtask 2 of Task 4.
4	One letter report (1 -5 pages) which summarizes the results of subtask 3.	Deliverable schedule will be provided if and when this subtask is initiated by the COR.
5	Letter Report – Draft Periodic Monitoring Report (PMR).	Deliverable schedule will be provided if and when this subtask is initiated by the COR.

4.0 REQUIRED STAFFING EXPERTISE

In general, the CNWRA staff working on this project should have advanced knowledge in the areas of material science, corrosion science, hydrology, geochemistry, radionuclide transport, health physics, and criticality. Staff with experience on conducting analyses supporting development of regulatory approaches and guidance documents would also be beneficial The CNWRA staff shall also be familiar with the requirements for licensing and certification of transportation packages and dry storage systems, per 10 CFR Part 71 and 10 CFR Part 72 requirements, and the disposal regulations at 10 CFR Part 63. Additionally, CNWRA should be familiar with the Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel (NUREG-2157).

5.0 MEETINGS AND TRAVEL

Teleconferences and videoconferences shall be conducted with the NRC staff, as needed. No travel is anticipated for this work.

6.0 PROJECT MANAGEMENT

The CNWRA shall maintain effective communication with NRC staff to help coordinate and integrate this effort with NRC's technical and decision-making activities. The CNWRA shall also coordinate all necessary NRC communication through the NRC COR and TPM. The NRC will assign a technical lead (principle investigator) from the NRC staff for each of the subtask areas who will serve as the CNWRA's direct technical interface for that area. This principle investigator will be responsible for: (1) correctly defining the focus for the CNWRA's activities for their assigned subtask, in coordination with the COR (see Section 12 for restrictions on

providing technical direction); (2) ensuring the proper focus is maintained during the technical activities; and (3) ensuring integration of efforts for the specific topic between the CNWRA and the NRC.

7.0 ACCEPTANCE CRITERIA

The contractor shall describe the applicable quality assurance program. Specifically, any work (i.e., data, interpretations, models, computations, methods, etc.) developed under the contract shall be performed under an adequate quality assurance program to ensure the technical accuracy and quality of the documents produced. Quality assurance comprises all those planned and systematic actions necessary to provide adequate confidence that the assessments have been satisfactorily performed. Quality assurance shall include verification for completeness, accuracy, consistency, and sufficient documentation to assure the reproducibility of the results of all calculations, laboratory experiments (if any), or modeling.

8.0 LEVEL OF EFFORT

The total estimated level of effort (LOE) for the work under this task order is 4,898 hours. The breakdown of the LOE specific to the task area is below.

		Base	Option 1	Option 2	Option 3	TOTAL
		9/24/18-9/30/19	10/1/19-9/30/20	10/1/20-9/30/21	10/1/21-9/30/22	
Task Area 1	**Subtask 1**	100				100
	Subtask 2	300	150			450
	Subtask 3		93	300	300	693
	Subtask 4			125		125
Task Area 2	**Subtask 1**	100				100
	Subtask 2	300	150			450
	Subtask 3		120	300	300	720
	Subtask 4			250		250

Task Area 3	**Subtask 1**	100				100
	Subtask 2	100				100
	Subtask 3		95	300	300	695
	Subtask 4			125		125
Task Area 4	**Subtask 1**	100				100
	Subtask 2	100	150			250
	Subtask 3		240			240
	Subtask4			200	200	400
	TOTAL	1200	998	1600	1100	4898

9.0 NRC FURNISHED MATERIALS

The NRC COR will provide copies of the necessary information, codes, and NRC products to conduct and document (e.g., for the CNWRA quality assurance record requirements) the activities for all work associated with this task order, to the cognizant CNWRA staff. The NRC will furnish the types and characteristics of the ARF types to be considered in this Task Order.

10.0 CONTRACTOR ACQUIRED MATERIAL

No materials are expected to be acquired.

11.0 REPORTS

Submittals for all task deliverables shall be submitted via electronic mail with electronic attachments consistent with the word processor in use at the NRC or in portable document format (i.e., *.pdf), as appropriate. Reports on any assessment by the contractor shall be in letter report form.

12.0 TECHNICAL/PROJECT DIRECTION

Jack Gwo and Kristina Banovac(Back-up) are the designated NRC CORs. The NRC COR may provide technical direction to the CNWRA staff during the duration of this task order. Technical

direction shall not constitute new assignments of work or changes of such a nature as to justify an adjustment in cost or period of performance. The NRC Contracting Officer will issue directions, if any, for changes in the scope of work, cost, or period of performance.

13.0 FINANCIAL AND TECHNICAL STATUS REPORTS

The CNWRA shall submit periodic technical and financial reports in accordance with the contract. The CNWRA should record its estimate of staff effort at the subtask level. The CNWRA should also track the work accomplished and the degree of completeness by subtask. The reports are due within 20 calendar days after the end of the report period (i.e., each four-week period). See the contract for further distribution requirements.

14.0 STANDARD WORK PRACTICES

For all draft and final reports under this agreement, the contractor shall assure that qualified technical staff other than the original author of the reports and other than the person who performed the original calculation performs an independent review of numerical computations, mathematical equations, and derivations. If the contractor proposes to check less than

100 percent of all computations, mathematical equations, and derivations in the report(s) (such as may be the case when there is a large number of routine, repetitive calculations), the contractor must first obtain written approval from the NRC COR. In addition, the contractor's management must review for consistency and readability and approve with two signatures all reports, including those, which do not contain numerical analyses. One signature must be from the contractor’s Project Manager, and one signature must be from a manager at a higher level than the contractor’s Project Manager. The Project Manager level or above must review and forward informal submittals/deliverables.

When revisions for reports are issued, a section must be included in the revised report to document dates of, reasons for, and scope of all changes made since the issuance of the first contractor’s approved report.

NRC has the option of appointing a Peer Group to review, comment, and recommend changes to the draft and final reports. The contractor may recommend candidates for the Peer Group for approval by the NRC COR. In the case of dissent in the content of the final report, the dissenting party shall have the option of stating its viewpoints and findings. Such statements may appear in the report as decided by the NRC.

This section does not intend to create the development of a formal quality assurance program nor does it require formal quality assurance program documentation or review.