INTERAGENCY AGREEMENT

1. IAA NO. NRC-HQ-60-17-D-0006

PAGE 1 OF 13

2. ORDER NO.

3. REQUISITION NO. NMSS-17-0193

4. SOLICITATION NO.

5. EFFECTIVE DATE 08/28/2017

6. AWARD DATE 09/18/2017

7. PERIOD OF PERFORMANCE 08/28/2017 TO 07/30/2020

8. SERVICING AGENCY
PACIFIC NORTHWEST NAT LAB
ALC:
DUNS: 000000000 +4:
US DEPARTMENT OF ENERGY
PACIFIC NORTHWEST SITE OFFICE
PO BOX 350 MS K9-42
RICHLAND WA 99352

POC Genice Madera
TELEPHONE NO. 509-372-4010

9. DELIVER TO
BRUCE LIN
US NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REGULATORY RESEARCH
11555 ROCKVILLE PIKE
ROCKVILLE MD 20852

10. REQUESTING AGENCY
ACQUISITION MANAGEMENT DIVISION
ALC: 31000001
DUNS: 040535809 +4:
US NUCLEAR REGULATORY COMMISSION
ONE WHITE FLINT NORTH
11555 ROCKVILLE PIKE
ROCKVILLE MD 20852-2738

POC Sandra Nesmith
TELEPHONE NO. 301-415-6836

11. INVOICE OFFICE
US NUCLEAR REGULATORY COMMISSION
TWO WHITE FLINT NORTH
11545 ROCKVILLE PIKE
MAILSTOP T9-B07
ROCKVILLE MD 20852-2738

12. ISSUING OFFICE
US NRC - HQ
ACQUISITION MANAGEMENT DIVISION
MAIL STOP TWFN-8E06M
WASHINGTON DC 20555-0001

13. LEGISLATIVE AUTHORITY
Energy Reorganization Act of 1974

14. PROJECT ID

15. PROJECT TITLE
EVALUATE THE EFFECTIVENESS OF NDE OF DRY STORAGE C

16. ACCOUNTING DATA
2017-C0200-FEEBASED-50-50D007-1061-33-6-199-253D-33-6-199-1061

17. ITEM NO.	18. SUPPLIES/SERVICES	19. QUANTITY	20. UNIT	21. UNIT PRICE	22. AMOUNT
	Ref: RES-17-0299 and NMSS-17-0193 NRC-HQ-60-17-D-0006 Title: Evaluate the Effectiveness of NDE of Dry Storage Canisters The NRC and Pacific Northwest National Laboratory (PNNL) hereby enter into this Agreement for the project entitled "Evaluate the Effectiveness of NDE of Dry Storage Canisters." Continued ...				

23. PAYMENT PROVISIONS

24. TOTAL AMOUNT $335,000.00

25a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (SERVICING)

26a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (REQUESTING)

25b. NAME AND TITLE

25c. DATE

26b. CONTRACTING OFFICER SANDRA R. NESMITH

26c. DATE 09/18/2017

Period of Performance: August 28, 2017 - June 30, 2020

Consideration and Obligations:

(a) Authorized Cost Ceiling (Base and All Options Exercised with this Award): $843,648.00.

(b) The amount presently obligated with respect to this DOE Agreement is $335,000.00. When and if the amount(s) paid and payable to the DOE Laboratory hereunder shall equal the obligated amount, the DOE Laboratory shall not be obligated to continue performance of the work unless and until the NRC Contracting Officer shall increase the amount obligated with respect to this DOE Agreement. Any work undertaken by the DOE Laboratory in excess of the obligated amount specified above is done so at the DOE Laboratory’s sole risk.

The following documents are hereby made a part of this Agreement:

Attachment No. 1: Statement of Work
Attachment No. 2: DOE Standard Terms and Conditions

This agreement is entered into pursuant to the authority of the Energy Reorganization Act of 1974, as amended (42 U.S.C 5801 et seq.). This work will be performed in accordance with the NRC/DOE Memorandum of Understanding dated November 24, 1998. To the best of our knowledge, the work requested will not place the DOE and its contractor in direct competition with the domestic private sector.

Notwithstanding the agreement effective dates and period of performance start dates stated elsewhere in the agreement, the effective date of the agreement and start date of the period of performance are the last date of signature by the parties.

[ ] Fee Recoverable Work
[X] Non-fee Recoverable Work
Continued ...

	PNNL PM and PI: Ryan M. Meyer, ryan.meyer@pnnl.gov, 509-372-4753 NRC COR: Bruce Lin, bruce.lin@nrc.gov, 301-415-2446 NRC Alternate COR: Matthew Gordon, matthew.gordon@nrc.gov 301-415-2152 DUNS: 040535809 TAS: 31X0200.320 ALC: 31000001 Master IAA: N/A				
00001	Authorized Ceiling (all options exercised) Total Obligated Amount: $843,648.00 Incrementally Funded Amount: $335,000.00 Period of Performance: 08/28/2017 to 06/30/2020 The total amount of award: $843,648.00. The obligation for this award is shown in box 24.				843,648.00

STATEMENT OF WORK

NRC Agreement Number	NRC Agreement Modification Number	NRC Task Order Number (If Applicable)	NRC Task Order Modification Number (If Applicable)
NRC-HQ-60-17-D-0006			

Project Title
Evaluate the Effectiveness of Nondestructive Examinations of Dry Storage Canisters

Job Code Number	B&R Number	DOE Laboratory
		Pacific Northwest National Laboratory

NRC Requisitioning Office
RES

NRC Form 187, Contract Security and Classification Requirements	
☐ Applicable ☒ Not Applicable	☐ Involves Proprietary Information ☐ Involves Sensitive Unclassified
☒ Non Fee-Recoverable	☐ Fee-Recoverable (If checked, complete all applicable sections below)
Docket Number (If Fee-Recoverable/Applicable)	**Inspection Report Number (If Fee Recoverable/Applicable)**
Technical Assignment Control Number (If Fee-Recoverable/Applicable)	**Technical Assignment Control Number Description (If Fee-Recoverable/Applicable)**

1.0 BACKGROUND

The U.S. Nuclear Regulatory Commission (NRC) licenses dry storage of spent nuclear fuel under the provisions of Title 10 of the Code of Federal Regulations (10 CFR), Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste." According to 10 CFR 72.42, the initial licensing term may be up to 40 years, after which the license may be renewed for periods up to 40 years. The requirements for license renewal include time-limited aging analyses (TLAAs) to demonstrate that structures, systems, and components (SSCs) important to safety (ITS) will continue to perform their intended function during the period of extended operation and a description of aging management programs (AMPs) for issues that could affect the ITS SSCs.

The Office of Nuclear Material Safety and Safeguards (NMSS) staff is currently developing a report titled, *Managing Aging Process in Storage (MAPS)* to identify credible aging degradation

mechanisms and appropriate aging management activities for dry storage systems (DSS). One of the potential degradation mechanisms identified is chloride-induced stress corrosion cracking (CISCC) of austenitic stainless steel canisters. The Electric Power Research Institute (EPRI) recently issued a technical report, "Aging Management Guidance to Address Potential Chloride-Induced Stress Corrosion Cracking of Welded Stainless Steel Canisters" (EPRI Report 3002008193, March 2017), that provides guidance and recommendations for development of an AMP to address the potential for CISCC in dry storage canisters.

The NRC has sponsored research at the Pacific Northwest National Laboratory (PNNL) related to Nondestructive Examination (NDE) and In-service Inspection (ISI) of DSS since 2013. Under previous research efforts, PNNL has developed two technical reports related to NDE of DSS: (1) PNNL-24412 "Nondestructive Examination Guidance for Dry Storage Casks" that provides an evaluation of NDE methods for in-service inspection of dry storage systems and (2) PNNL-22495 "NDE to Manage Atmospheric SCC in Canister for Dry Storage of Spent Fuel: An Assessment" that provides an assessment of potential NDE methods for detection of stress corrosion cracking in DSS canisters.

The American Society of Mechanical Engineers (ASME) is currently developing a code case for the in-service inspection (ISI) of DSS canisters. The code case will establish requirements for examination and inspection, including applicable techniques, inspection frequency, qualification standards as well as acceptance standard. In addition, the nuclear industry and Department of Energy (DOE) partners are jointly developing inspection systems for conducting inspections of DSS canisters.

NRC staff currently needs support in developing the technical basis behind ISI requirements for dry storage canisters. Specifically, contractor support focused on the effectiveness of NDE inspection methods and flaw assessment are needed to support development of ASME code requirements and NRC regulatory positions.

2.0 OBJECTIVES

The objectives of this project are: (1) assess the capability of the inspection systems to access the canister surface and detect flaws; (2) evaluate the detection and sizing capability of the proposed NDE methods; (3) provide recommendations to NRC with respect to in-service inspection requirements and flaw assessment for DSS canisters; (4) develop a testing plan to measure the CISCC crack growth rate (optional); and (5) develop CISCC flaws for NDE and crack growth assessment (optional).

3.0 SCOPE OF WORK

PNNL shall provide all the personnel, equipment and facilities necessary to accomplish the tasks and deliverables described in this statement of work (SOW). PNNL shall assist NRC in assessing the effectiveness of NDE methods for inspecting DSS canisters and developing technical basis to support ISI requirements for periodic inspection of DSS canisters. The specific tasks are described in the following section.

4.0 SPECIFIC TASKS

Task 1 – Assess the Effectiveness of Inspection Systems to Access the Canister and Perform Inspection

The objective of this task is to evaluate the effectiveness of industry developed NDE inspection systems to access the canister surface and perform inspection. Under a previous program, PNNL procured a mockup of a full diameter, partial length canister. PNNL is in the process of implanting flaws in the canister mockup. In this task, PNNL shall perform radiographic testing of the canister mockup to identify any fabrication related flaws in the welds. In addition, PNNL shall characterize the implanted flaws and introduce additional defects such as rust and pitting corrosion in the canister mockup to simulate in-service degradation. PNNL shall construct mockups of storage overpack with wood or other suitable materials to simulate access restrictions in both vertical systems and horizontal systems. PNNL shall construct one mockup to simulate access restrictions in vertical storage systems and up to two mockups to simulate access restrictions in horizontal systems due to significant design variations.

The canister mockup and simulated overpack will serve as a test system to assess the capability of the industry developed inspection systems to adequately access the canister surface and to perform in-service inspections. The assessment shall include the ability of the inspection systems to access the canister surfaces/welds through access openings and determine the feasibility of performing visual (VT3 or VT1) and/or volumetric inspections. The assessment shall also identify the percentage of the surface area that can be realistically inspected and whether the inspection systems can detect the implanted flaws and surface defects. PNNL shall coordinate this effort with EPRI and industry/DOE partners that are working on development of canister inspection systems.

Deliverable: A technical letter report (TLR) summarizing the results of the assessment.

Task 2 – Evaluate the Detection and Sizing Capability of the NDE Methods

The objective of this task is to evaluate the capability of the proposed NDE methods (e.g. eddy current and ultrasonic) to adequately detect and characterize CISCC flaws in canisters. PNNL shall develop a test plan and work with industry partners such as EPRI and inspection vendors to assess the performance of the NDE methods to adequately detect and size flaws using mockups with simulated flaws. As part of the ongoing effort to develop NDE methods for inspecting the canisters, EPRI has procured test plates with simulated flaws for use to qualify inspection systems. Also, test plates that were used in prior NDE research programs or the full diameter mockup as described in Task 1 may be suitable for use in this assessment as well. If additional test plates are needed, PNNL shall procure the test plates with implanted flaws that are suitable for assessing industry proposed NDE methods. PNNL shall coordinate with EPRI and industry vendors to conduct testing to assess the capabilities and limitations of the proposed NDE methods to detect and characterize CISCC cracks. PNNL shall review the results to attempt to quantify the effectiveness of the proposed NDE methods.

In addition, PNNL shall evaluate the use of NDE methods for in-service monitoring of flaw growths. Surface and volumetric NDE methods may be used to characterize the flaw at different times to determine whether the flaw is growing and if so, the flaw growth rate. The evaluation should take into consideration limitations of potential techniques to size flaws accurately, and how this will be considered in the need for subsequent inspections, inspection frequencies and planning of mitigation actions.

Deliverable: A TLR summarizing the detection and sizing results and the assessment of using NDE methods for in-service monitoring of flaw propagation.

Task 3 – In-service Inspection Requirements for Stainless Steel Canisters

The ASME is currently developing code requirements for the examination of DSS canisters and flaw acceptance criteria. The objective of this task is to assess the code requirements in the areas of inspection techniques, qualification standards, inspection frequencies, and acceptance criteria and provide recommendations to the NRC on the adequacy of the ASME code requirements. As part of this task, PNNL will use its expertise in NDE and ASME Code experience to contribute to the development of ASME code requirements for in-service inspection of canisters and to assess the adequacy of the technical basis behind ISI requirements. This task may also include reviews of industry developed technical reports related to inspection of dry storage canisters. PNNL shall consult with the NRC COR regarding expectations for the depth of review and need for confirmatory analyses.

Deliverable: Provide technical input/summary reports as requested by the NRC.

Task 4 - CISCC Crack Growth Test Plan Development

The objective of this optional task is to develop a testing plan to measure the CISCC crack growth rate (CGR) for austenitic stainless steel in conditions representative of those experienced by DSS in operational service. The potential for CISCC initiation under canister surface conditions is known, but the magnitude of potential CISCC CGRs has significant uncertainty. An improved understanding of potential CISCC CGRs on canisters in service would help bolster the technical basis for canister inspection frequency and scope.

The intent of the testing plan is to identify issues that should be considered in the acquisition and interpretation of CGR data, particularly those which may affect the level of effort, cost, and time required for such tests. The testing plan shall address at least the following topics:

1. A review and assessment of prior work reported in the technical literature concerning CISCC CGR testing, including any perceived limitations or uncertainties associated with those tests. A key challenge in CISCC CGR testing is the uncertainty of the actual canister conditions, including environment, stress, and temperature. Environmental conditions such as humidity and the presence and concentration of chemical species are especially uncertain. Given this uncertainty, the plan should address how to effectively represent or bound the likely in-service conditions.

2. A discussion of testing methodologies potentially suitable for measuring the CISCC CGR, including physical descriptions of test specimens and testing machines (e.g., load trains, environmental chambers, data acquisition units, etc.). The testing methodologies to be addressed shall include, at minimum, that used for primary water stress corrosion crack growth rate testing at PNNL, bending tests, and spring and/or bolt loaded tests.

3. A discussion of the advantages and disadvantages of the methodologies identified in (2), with respect to factors including test duration, cost, complexity, and data quality. Given the uncertainty of in-service canister conditions mentioned in (1) above, the plan should address how to effectively represent or bound the likely in-service conditions including, environment, stress, and temperature.

4. A discussion of potential approaches to measure and control the exposure of specimens to chlorides during the course of testing, and the compatibility of these approaches with the testing methodologies identified in (2).

Deliverable: A TLR documenting the CISCC CGR testing plan.

Task 5 – Development of CISCC Flaws for NDE and Crack Growth Evaluation

The objective of this task is to attempt to produce realistic CISCC flaws on welded stainless steel plates. The CISCC flaws can then be used to compare the NDE responses to simulated flaws to assess the performance of the NDE methods. In addition, the CISCC flaws could be used in testing systems with active crack monitoring to assess crack propagation rates.

PNNL shall produce stainless steel mockups to include a weld typical of that used for fabrication of dry storage canisters. PNNL shall attempt to initiate and grow CISCC cracks on the mockups using suitable laboratory methods. PNNL shall keep the NRC COR engaged on the proposed methods for initiating CISCC flaws and monitoring crack growth for timely decisions of testing sequences.

As part of this task, PNNL will compare the NDE responses of CISCC flaws with simulated flaws using standardized methods (e.g. thermal fatigue or mechanical methods) to assess the impact of flaw characteristics on the NDE performance. The results of these activities should be incorporated into Task 2 assessment of NDE detection and sizing capability.

Deliverable: A summary report documenting the methods used to produce CISCC flaws and the crack propagation rates. The results of the NDE assessment shall be incorporated into Task 2.

Task 6 – Project Management

A project management task is needed to coordinate all other activities related to this project. The project manager will be responsible for overseeing the work being performed, including developing detailed program plans, tracking all program deliverables, ensuring they are delivered on time and within planned budgets, coordinating communications with the NRC, preparing monthly letter status reports, organizing and conducting program reviews as directed

by NRC, coordinating and supporting program modifications and re-direction based on emergent issues, and supporting other NRC requests.

5.0 DELIVERABLES AND/OR MILESTONES SCHEDULE

Task 1 – Provide a draft TLR summarizing the results of inspection assessment within 18 months of award of contract.

Task 2 – Provide a draft TLR summarizing the results of detection and sizing evaluation within 24 months of award of contract.

Task 3 – Provide technical input/summary reports as requested by the NRC.

Task 4 – Provide a TLR documenting the CISCC crack growth test plan with 6 months of award of contract.

Task 5 – Provide a summary report documenting the development of CISCC flaws within 9 months of award of contract.

6.0 TECHNICAL AND OTHER SPECIAL QUALIFICATIONS REQUIRED

Professional staff engaged in the review and evaluation should be familiar with dry storage system designs, knowledgeable about the technical aspects of aging management, and reactor in-service inspection requirements. Specific technical expertise may be needed for the following areas: materials engineering, mechanical engineering, nuclear engineering, applied physics, and/or non-destructive evaluation methodologies. Staff shall also be familiar with NRC regulatory processes for licensing of dry storage. PNNL shall assign a project manager who is experienced with overseeing multidisciplinary teams and has strong organizational and communication skills.

Key personnel assigned to this agreement include the following individuals:

7.0 MEETINGS AND TRAVEL

Anticipated travel includes the trips below The anticipated travel may be modified by agreement between NRC and the contractor. All travel is subject to the availability of funds and requires written Government approval from the Contracting Officer (CO), unless otherwise delegated to the COR.

Foreign travel for the PNNL personnel requires a 60-day lead time for NRC approval. For prior approval of foreign travel, PNNL shall submit an NRC Form 445, “Request for Approval of Official Foreign Travel.” NRC Form 445 is available in the MD 11.7 Documents library and on the NRC Web site at: http://www.nrc.gov/reading-rm/doc-collections/forms/. All foreign travel must be first approved by the NRC Director of the Office of International Programs (OIP) and the Director of RES.

Anticipated Travel

FY 2019 ASME Code meeting/Industry meeting
1 person, 4 days, Location and Date TBD

FY 2019 ASME Code meeting/Industry meeting
1 person, 4 days, Location and Date TBD

FY 2020 Technical meeting with NRC staff, EPRI staff and/or industry representatives
1 person, 5 days, Charlotte, NC

FY 2020 Technical meeting with NRC staff, EPRI staff and/or industry representatives
1 person, 4 days, Rockville, MD

9.0 REPORTING REQUIREMENTS

PNNL is responsible for structuring the deliverable to follow agency standards. The current agency standard is Microsoft Office Suite 2010. The current agency Portable Document Format (PDF) standard is Adobe Acrobat 9 Professional. Deliverables must be submitted free of spelling and grammatical errors and conform to requirements stated in this section.

Monthly Letter Status Reports

In accordance with Management Directive 11.7, NRC Procedures for Placement and Monitoring of Work with the U.S. Department of Energy, the DOE Laboratory must electronically submit a Monthly Letter Status Report (MLSR) by the 20th day of each month to the Contracting Officer Representative (COR) with copies to the Contracting Officer (CO) and the Office Administration/Acquisition Management Division to ContractsPOT.Resource@nrc.gov. If a project is a task ordering agreement, a separate MLSR must be submitted for each task order with a summary project MLSR, even if no work has been performed during a reporting period. Once NRC has determined that all work on a task order is completed and that final costs are acceptable, a task order may be omitted from the MLSR.

The MLSR must include the following: agreement number; task order number, if applicable; job code number; title of the project; project period of performance; task order period of performance, if applicable; COR's name, telephone number, and e-mail address; full name and address of the performing organization; principal investigator's name, telephone number, and e-mail address; and reporting period.

10.0 PERIOD OF PERFORMANCE

The period of performance for this work is 36 months from effective date of the agreement.

11.0 CONTRACTING OFFICER'S REPRESENTATIVE

The COR monitors all technical aspects of the agreement/task order and assists in its administration. The COR is authorized to perform the following functions: assure that the DOE Laboratory performs the technical requirements of the agreement/task order; perform inspections necessary in connection with agreement/task order performance; maintain written

and oral communications with the DOE Laboratory concerning technical aspects of the agreement/task order; issue written interpretations of technical requirements, including Government drawings, designs, specifications; monitor the DOE Laboratory's performance and notify the DOE Laboratory of any deficiencies; coordinate availability of NRC-furnished material and/or GFP; and provide site entry of DOE Laboratory personnel.

Contracting Officer's Representative
Name: Bruce Lin
Agency: U.S. Nuclear Regulatory Commission
Office: Office of Nuclear Regulatory Research
Mail Stop: T10-A36
Washington, DC 20555-0001
E-Mail: bruce.lin@nrc.gov
Phone: (301) 415-2446

Alternate Contracting Officer's Representative
Name: Matthew Gordon
Agency: U.S. Nuclear Regulatory Commission
Office: Office of Nuclear Regulatory Research
Mail Stop: T10-A36
Washington, DC 20555-0001
E-Mail: matthew.gordon@nrc.gov
Phone: (301) 415-2152

12.0 MATERIALS REQUIRED

N/A

13.0 NRC-FURNISHED PROPERTY/MATERIALS

N/A

14.0 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 DOE Laboratory to ensure that these quality criteria are adequately addressed throughout the course of the research that is performed. The NRC COR will review all research products with these criteria in mind.

15.0 STANDARDS FOR CONTRACTORS WHO PREPARE NUREG-SERIES MANUSCRIPTS

The U.S. Nuclear Regulatory Commission (NRC) began to capture most of its official records electronically on January 1, 2000. The NRC will capture each final NUREG-series publication in its native application. Therefore, please submit your final manuscript that has been approved by your NRC Project Manager in both electronic and camera-ready copy.

The final manuscript shall be of archival quality and comply with the requirements of NRC Management Directive 3.7 “NUREG-Series Publications.” The document shall be technically edited consistent with NUREG–1379, Rev. 2 (May 2009) "NRC Editorial Style Guide." The goals of the "NRC Editorial Style Guide" are readability and consistency for all agency documents.

All format guidance, as specified in NUREG-0650, “Preparing NUREG-Series Publications," Rev. 2 (January 1999), will remain the same with one exception. You will no longer be required to include the NUREG-series designator on the bottom of each page of the manuscript. The NRC will assign this designator when we send the camera-ready copy to the printer and will place the designator on the cover, title page, and spine. The designator for each report will no longer be assigned when the decision to prepare a publication is made. The NRC's Publishing Services Branch will inform the NRC Project Manager for the publication of the assigned designator when the final manuscript is sent to the printer.

For the electronic manuscript, PNNL shall prepare the text in Microsoft Word, and use any of the following file types for charts, spreadsheets, and the like.

File Types to be Used for NUREG-Series Publications	
File Type	File Extension
Microsoft®Word®	.doc
Microsoft® PowerPoint®	.ppt
Microsoft®Excel	.xls
Microsoft®Access	.mdb
Portable Document Format	.pdf

This list is subject to change if new software packages come into common use at NRC or by our licensees or other stakeholders that participate in the electronic submission process. If a

portion of your manuscript is from another source and you cannot obtain an acceptable electronic file type for this portion (e.g., an appendix from an old publication), the NRC can, if necessary, create a tagged image file format (file extension.tif) for that portion of your report. Note that you should continue to submit original photographs, which will be scanned, since digitized photographs do not print well.

If you choose to publish a compact disk (CD) of your publication, place on the CD copies of the manuscript in both (1) a portable document format (PDF); (2) a Microsoft Word file format, and (3) an Adobe Acrobat Reader, or, alternatively, print instructions for obtaining a free copy of Adobe Acrobat Reader on the back cover insert of the jewel box.

16.0 OTHER CONSIDERATIONS (TYPE N/A IF NOT APPLICABLE)

N/A