U.S. DEPARTMENT OF ENERGY

OMB NO. 1901-0287
Expiration Date: 08/31/2029
Burden: 90 Hours

FORM GC-859
NUCLEAR FUEL DATA SURVEY

Legislative Authority:	Data on this mandatory form are collected under authority of the Federal Energy Administration Act of 1974 (15 USC Schedule 761 et seq.), Department of Energy Organization Act (42 USC 7101 et seq.), and the Nuclear Waste Policy Act of 1982, as amended (42 USC 10101 et seq.). Failure to file after receiving notification from Pacific Northwest National Laboratory (PNNL) on behalf of the U.S. Department of Energy may result in criminal fines, civil penalties and other sanctions as provided by the law. Data being collected on this form are not considered to be confidential. Title 18 U.S.C. 1001 makes it a criminal offense for any person knowingly and willingly to make to any Agency or Department of the United States any false, fictitious, or fraudulent statements as to any matter within its jurisdiction. Information regarding security measures or material control and accounting procedures is not solicited; inclusion of such information in this data call is specifically prohibited.
Public Reporting Burden:	The public reporting burden for this collection of information is estimated to average 90 hours per response. The estimate by respondent category is 100 hours per response for operating nuclear reactors, 60 hours per response for permanently shutdown nuclear reactors, and 40 hours per response for storage facilities and research/test reactors. The estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, through the website or emailed to gc859help@pnnl.gov.
Unsolicited and Prohibited Data:	Information regarding security measures or material control and accounting procedures is not solicited; inclusion of such information in this data is specifically prohibited.
Form Due Date:	This form shall be submitted by October 31, 2028. Unless otherwise indicated, data on the form should reflect the spent fuel discharged from January 1, 2023 - December 31, 2027.
Voluntary Data:	Schedule C.1.2 Fuel Cycle History is not mandatory.
PNNL Contacts:	Refer all questions to the PNNL GC-859 Survey Team at (509) 372-7767, by email to gc859help@pnnl.gov, by message through the website, or by mail to: *Battelle for the USDOE* *Attn: GC-859 Survey Team,* *MSIN GC-859* *902 Battelle Blvd* *Richland, WA 99354* Please use the following website to submit your data: ***https://gc859.pnnl.gov*** Alternatively, you may request a copy from the PNNL GC-859 Survey Team contact.

RESPONDENT IDENTIFICATION

Site Operator Name: _____

REPORT PERIOD

Begin Report Period: January 1, 2023
End Report Period: December 31, 2027

If this is a resubmission, insert X in this block ☐

If there are no data changes from the previous GC-859 submission, insert X in this block ☐

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SCHEDULE A: SITE OPERATOR DATA

A.1 Site Operator Name/Identifier

A.1.1 Site Operator Name: _____

A.1.2 List all reactors being covered by this report.

See Appendix C, "Reactor or Facility and Spent Fuel Storage Site."

Reactor Identifier	Reactor Name

A.1.3 List all spent fuel storage facilities being covered by this report.

See Appendix C, "Reactor or Facility and Spent Fuel Storage Site."

Storage Facility Identifier	Storage Facility Name

A.2 Site Operator Point of Contact

Provide a site operator point of contact for verification of information provided on this form.

Name (First and Last): _____

Title: _____

Mailing Address: _____

_____

_____

City: _____ State: _____ Zip Code: _____

Telephone Number: _____

Email: _____

A.3 Authorized Signature/Certification

I certify as a cognizant individual that the historical information contained herein and in any associated electronic media supplied and other materials appended hereto are true and accurate to the best of my knowledge. (NOTE: Corporate Officer signature is not required, but the signatory must be appropriately authorized.)

Name (First and Last): _____

Title: _____

Signature: _____

Date: _____

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COMMENTS

Provide any comments you have concerning Site Operator Data (Section A.1, A.2, A.3) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

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SCHEDULE B: REACTOR DATA

B.1 Reactor Point of Contact

Complete a Schedule B.1 for each reactor, including operating and shutdown reactors.

Provide a reactor point of contact for verification of information provided on this form.

If the person is also the site operator point of contact, insert X in this block. ☐

Name (First and Last): _____

Title: _____

Mailing Address: _____

_____

_____

City: _____ State: _____ Zip Code: _____

Telephone Number: _____

Email: _____

B.2 Discontinued

B.3 Cycle Data

Provide the following data for all operating cycles.

The first cycle of a reactor's operations is designated 01 and successive cycles are numbered consecutively. Operating cycles covered by this report should continue the sequential cycle numbering listed in the previous reporting period, which are provided.

If the reactor has experienced an outage in the midst of a cycle where fuel assemblies were temporarily or permanently discharged, indicate by providing subcycle numbers and start up and shutdown dates as if the subcycle were a complete cycle. Designate subcycles as a, b, c, etc. (example 16a, 16b, 16c). If no fuel assemblies were discharged, simply report the cycle number, start up and shutdown dates without regard to subcycles.

Cycle Number	Start Up Date (MM/DD/YYYY)	Shutdown Date (MM/DD/YYYY)

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COMMENTS

Provide any comments you have concerning Reactor Data (Section B.3) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

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SCHEDULE C: FUEL DATA

C.1 Instructions for Data On Discharged Fuel Assemblies and Non-Fuel Components Integral to the Assembly

The Form GC-859 survey collects data on an assembly-specific basis to ensure that all owners have been properly allocated spent nuclear fuel acceptance capacity in the *Acceptance Priority Ranking & Annual Capacity Report* (APR/ACR). For this reason, respondents are requested to report all discharged fuel including spent nuclear fuel that has been shipped/transferred to another storage site location. Report permanently discharged fuel only. If you are not certain if an assembly will be reinserted, prioritization rules suggest that this is in the utility's interest to report it as permanently discharged (and modify the total burnup, last cycle number, and last cycle shutdown date later if the assembly is subsequently reinserted).

The assembly specific data to be reported in C.1.1 are as follows:

Column	Data Element	Description
1	**Assembly Identifier**	The unique operator-assigned identifier or the American National Standards Institute (ANSI) identifier. The identifier indicated as the "Primary" assembly identifier should be used throughout the survey form.
2	**Initial Uranium Content**	The initial uranium content of the entire fuel assembly in kilograms of uranium, not adjusted for any removed rods (reported to the nearest thousandth of a kilogram).
3	**Initial Enrichment**	The initial enrichment of the assembly (reported to the nearest hundredth of a percent). Report the Maximum Planar-Average Initial Enrichment and Assembly-Average Initial Enrichment (optional).
4	**Initial Plutonium Content**	Provide the initial plutonium content (in kg Pu) and the concentrations of ^{239}Pu and ^{241}Pu, expressed as weight percentages of the total plutonium.
5	**Discharge Burnup**	The assembly burnup at discharge (reported in megawatt days thermal per metric ton of (initially loaded) uranium (MWD_t/MTHM).
6	**Last Cycle Number**	The cycle number (including subcycles) for the assembly's final cycle of irradiation. Also, other cycles can be given in reverse date order (last cycle listed first).
7	**Fuel Assembly Type Code**	Select the Fuel Assembly Type Code for each assembly from the dropdown menu and Appendix E. Alternatively, respondents can use Schedule C.1.3 to report Fuel Assembly Type Codes by cycle and fuel batch. See Schedule C.1.3 for instructions.
8	**Assembly Status**	Check the appropriate status indicators from the following table. Check all that apply.
9	**Storage Location**	The pool or dry storage site (from Appendix C, "Reactor or Facility and Spent Fuel Storage Site") corresponding to the current storage location of the assembly.

Status Identifier	Description
8A	Non-standard assembly.[1, 2]
8B	Failed fuel.[3]
8C	Containerized assembly; the assembly has been placed in a single-element container. Do not report assemblies that have been placed into a multi-element canister as containerized.
8D	Fuel rods have been removed from the original assembly.
8E	Fueled replacement rods have been inserted into the assembly (8D must also be checked for all 8E assemblies).
8F	Stainless steel or other non-fueled replacement rods have been inserted into the assembly (8D must also be checked for all 8F assemblies).
8G	Assembly has special characteristics that do not fall into the previous categories. Provide a description of these characteristics in the comment box.

1. Standard assembly, non-standard assembly, and non-fuel component as defined in the Standard Contract Appendix E. If the storage of non-fuel components within an **assembly stored in dry storage** classifies that assembly as non-standard according to Appendix E of the Standard Contract, check the Yes box in the Non-standard Assembly column in C.1.1. For example, changes to an assembly's maximum physical dimensions due to the NFC may cause it to be classified as non-standard. See Schedule D.3.3 for reporting of non-fuel components within an assembly stored in dry storage.
2. Respondents need not report assemblies in the spent fuel pool as non-standard if the minimum cooling time (Nonstandard Fuel Class NS-3) is not met as this can be determined by the Last Cycle shutdown date.
3. Failed Fuel Classes F-1 and F-3 are defined in the Standard Contract Appendix E. For Class F-2 *Radioactive "Leakage"* use the definition consistent with NRC NUREG-1617, Standard Review Plan for Transportation Packages for Spent Nuclear Fuel: "Damaged Spent Nuclear Fuel: spent nuclear fuel with known or suspected cladding defects greater than a hairline crack or a pinhole leak."

Note: A copy of the Standard Contract is provided in Appendix B.

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C.1.1 Data On Discharged Fuel Assemblies and Non-Fuel Components Integral to the Assembly

Report **all** discharged fuel assemblies and non-fuel components integral to the assembly. See the Table in Section C.1 for descriptions of individual data elements in the table below.

1		2	3		4			5	6	7	8							9
Assembly Identifier		Initial Uranium Content	Initial Enrichment		Mixed Oxide Fuel			Discharge Burnup	Last Cycle Number	Fuel Assembly Type Code[1]	Assembly Status Indicators							Storage Location
			Maximum Planar-Average Initial Enrichment	Assembly-Average Initial Enrichment	Initial Plutonium Content	Pu-239 Wt%	Pu-241 Wt%				Non-Standard	Failed	Containerized	Fuel Rod(s) Removed	Replacement Rods (Fueled)	Replacement Rods (Non- fueled)	Other	
Primary	Secondary (ANSI)	kgU	Weight % of U-235 in U	Weight % of U-235 in U	kgPu	Weight % of Pu-239 in Pu	Weight % of Pu-241 in Pu	(MWDt/MTHM)	-	-	8A	8B	8C	8D	8E	8F	8G	-
											❑	❑	❑	❑	❑	❑	❑	
											❑	❑	❑	❑	❑	❑	❑	
											❑	❑	❑	❑	❑	❑	❑	
											❑	❑	❑	❑	❑	❑	❑	
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											❑	❑	❑	❑	❑	❑	❑	
											❑	❑	❑	❑	❑	❑	❑	

[1] Fuel Assembly Type data selected from Appendix E or entered by cycle and fuel batch using Schedule C.1.3.

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COMMENTS

Provide any comments you have concerning Data On Discharged Fuel Assemblies and Non-Fuel Components Integral to the Assembly (Section C.1.1) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

C.1.2 Fuel Cycle History (Voluntary)

For all assemblies irradiated in this reactor, including each assembly listed in Table C.1.1, identify the cycles during which the assembly was irradiated in the reactor core and the cumulative assembly burnup for each cycle. Include data for all discharged assemblies. The Assembly Identifier must match the primary assembly identifier in Section C.1.1 of the current or prior data collection, whichever is applicable.

Providing cycle numbers and cumulative burnup data for each assembly is voluntary. To the extent that a respondent provides complete, assembly level cumulative burnup data by cycle number, the utility is considered to have satisfied the utility's obligation under the Standard Contract for the Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (10 CFR 961) Appendix F - *Detailed Description of Purchaser's Fuel* subsection IV regarding assembly level "irradiation history."

Assembly Identifier	Reactor and Cycle Numbers						Cumulative Burnup for Each Cycle (MWD_t/MTHM)					

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COMMENTS

Provide any comments you have concerning Fuel Cycle History (Section C.1.2) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

C.1.3 Fuel Assembly Type Code

Fuel Assembly Types are used to describe a combination of fuel vendor, lattice size, and fuel features. The Fuel Assembly Type is based on the Oak Ridge National Lab report ORNL/TM-10901 "A Classification Scheme for LWR Fuel Assemblies" November 1988. Fuel Assembly Type is identified via the use of Fuel Assembly Type Codes which are provided in Appendix E.

Within the GC-859 software, Fuel Assembly Type Code selection is limited to the codes that are appropriate for each individual reactor, so that only a limited number of choices are available. Because most reloads will consist of only one or two Fuel Assembly Types, C.1.3 simplifies the process by removing the need to report Fuel Assembly Types on an individual assembly basis.

Respondents should report the identification of Fuel Assembly Types for batches of fuel as assemblies are initially loaded into the reactor core. The associated range of assembly IDs and number of assemblies is also requested in order for PNNL to accurately transfer the Fuel Assembly Type Codes into Table C.1.1.

Initial Cycle in Core	Assembly ID [1] Range	Number of Assemblies	Fuel Assembly Type Code [2, 3, 4]

1. Assembly Identifier must match the primary assembly identifier in Section C.1.1 of the current or prior data collection, whichever is applicable.

2. Select the Fuel Assembly Type Code from Appendix E or the drop-down menu.

3. If the Fuel Assembly Type Code is not listed in Appendix E, please contact PNNL.

4. Some reactors have their own unique codes. This can be found in Appendix E.10.

Fuel Assembly Type data for all assemblies discharged from January 1, 2018 – December 31, 2022 was collected in the 2023 GC-859 Survey. Survey respondents that provided the requested Fuel Assembly Type data in the previous survey and already included Fuel Assembly Type data under Schedule C.1.1 for the current survey cycle **do not need to repeat reporting this information** under Schedule C.1.3.

For discharges that are early in this range, the ***Initial Cycle in Core*** may extend back several cycles. For example, if Cycle 10 shutdown in January 2003 and it contained three regions of fuel with LTAs in Cycle 10, input to Table C.1.3 for the first few cycles may look like the following:

Example C.1.3 Fuel Assembly Type Code input			
Initial Cycle in Core	**Assembly ID Range**	**Number of Assemblies**	**Fuel Assembly Type Code**
8	K01 – K80	80	C1414WT
9	L01 – L68	68	C1414WT
10	M01 - M12, M17 - M76	72	C1414WT
10	M13 – M16	4	C14_OTH
11	N01 – N80	80	C1414WT

Fuel Assembly Type Codes for fuel discharged from January 1, 2023 - December 31, 2027 may also be entered in Schedule C.1.3 if not already entered in Schedule C.1.1.

COMMENTS

Provide any comments you have concerning Fuel Assembly Type Code (Section C.1.3) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

C.1.4 Shipments/Transfers of Discharged Fuel

Report all shipments of fuel assemblies from this site to another storage site (pool or dry storage) since December 31, 2022. Use the storage site identifiers from Appendix C, “Reactor or Facility and Spent Fuel Storage Site.”

Assembly Identifier	Original Storage Site Identifier	Current Storage Site Identifier	Shipment Date

COMMENTS

Provide any comments you have concerning Shipments/Transfers of Discharged Fuel (Section C.1.4) in the comment section below. The comments may include a description of whether the shipment related to an entire fuel assembly or a rod or other part thereof. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

C.2 Projected Assembly Discharges

Projections of discharged assemblies shall be reported on a group basis, where each assembly in the group has the following common characteristics:

- Reactor/Cycle History.
- Average Initial Heavy Metal Content for an Assembly in the Group (within 3 kg for BWR, 5 kg for PWR). Report plutonium content for Mixed Oxide Fuel.
- Assembly Average Initial Enrichment (within nearest one tenth of a percent). Report plutonium enrichment for Mixed Oxide Fuel.
- Projected Final Average Discharge Burnup of the Group. The maximum assembly discharge burnup should be within 5% of the group's average burnup (in MWDt/MTHM). Round the final average burnup to the nearest thousand MWDt/MTHM. For example, a group average discharge burnup of 50,000 MWDt/MTHM would include assemblies with maximum discharge burnups in the range of approximately 47,500 to 52,500 MWDt/MTHM.

Group Identifier - The group identifier is a symbolic name for the group, used for reporting purposes. It reflects assemblies with similar enrichment, expected burnup, and planned cycle number. For example, if there were assemblies from cycle 15 with three different enrichments, the groups could be labeled as 15-1, 15-2, and 15-3, or using a similar naming convention.

Report projections of discharged assemblies for at least the next three cycles.

Cycle Number	Planned Cycle Shutdown Date (MM/YYYY)	Group Identifier	Projected Number of Assemblies Discharged in the Group	Average Initial Heavy Metal Content for an Assembly in the Group		Assembly-Average Initial Enrichment			Projected Final Average Discharge Burnup per Assembly in the Group (MWD_t/MTHM)
				Initial kgU	Initial kgPu	wt. % U-235 in U	wt. % Pu-239 in Pu	wt. % Pu-241 in Pu	

C.3 Special Fuel Forms

Report in this section, data on the following. Check all that apply.

____ Single Assembly Containers (Complete Schedule C.3.1)

____ Non-containerized Fuel Rods/Pieces (Complete Schedule C.3.2)

____ Consolidated/Reconstituted/Reconstructed Assemblies; Dimensionally or Other than LWR Non-Standard Assemblies; & Failed Fuel (Complete Schedule C.3.3)

C.3.1 Special Fuel Form – Containers

A container is defined as any single assembly container designed to confine contents that may be delivered to a DOE facility. Within this schedule, material may include damaged assemblies, reconstituted assemblies, fuel rods that have been removed from an assembly, and miscellaneous fuel. Empty containers should not be reported. This schedule does not include Damaged Fuel Cans (DFCs) for dry storage and multi-assembly canisters for dry storage; DFCs for dry storage are reported in Schedule D.3.3. Multi-assembly canisters for dry storage are reported in D.3.2.

Does your facility have single assembly containers?

_____ Yes. Complete the remainder of **Schedule C.3.1**

_____ No. Skip to **Schedule C.3.2**

For all single assembly containers, provide a detailed description.

C.3.1.1 Single Assembly Containers Description

Container Identifier	Container Shape		Container Dimensions (to the nearest 0.1 inch)			Loaded Weight (to nearest lb.)	Storage Identifier[1]
	C	R	Length	Diameter/ Width	Depth		
	❑	❑					
	❑	❑					
	❑	❑					
	❑	❑					
	❑	❑					
	❑	❑					
	❑	❑					
	❑	❑					
	❑	❑					

C = cylindrical R = rectangular

[1]See Appendix C, "Reactor or Facility and Spent Fuel Storage Site."

C.3.1.2 Qualitative Single Assembly Container Contents

For each container identified in Schedule **C.3.1.1**, provide a qualitative description of the contents and identify the method used to close the container. Also indicate whether the container may be handled as a standard fuel assembly.

Container Identifier	Description of Contents (check all that apply) [1]	Container Closure			Is Container Handled As A Standard Fuel Assembly?	
		B	W	NS	Yes	No
	__ Assembly with failed fuel __ Reconstituted/reconstructed fuel assembly __ Fuel rods __ Fuel debris (rod pieces, fuel pellets, etc.).	❑	❑	❑	❑	❑
	__ Assembly with failed fuel __ Reconstituted/reconstructed fuel assembly __ Fuel rods __ Fuel debris (rod pieces, fuel pellets, etc.).	❑	❑	❑	❑	❑
	__ Assembly with failed fuel __ Reconstituted/reconstructed fuel assembly __ Fuel rods __ Fuel debris (rod pieces, fuel pellets, etc.).	❑	❑	❑	❑	❑

B = bolted W = welded NS = not sealed containers e.g. baskets

1. Failed Fuel as defined in the Standard Contract and Appendix D – Glossary of Terms

C.3.1.3 Detailed Single Assembly Container Contents

For each container identified in Schedule **C.3.1.1**, provide a detailed description of the contents.

Container Identifier	Source Assembly Identifier[1]	Number of Fuel Rod Equivalents from Assembly	Initial Heavy Metal Content[2]	Discharge Burnup[3] (MWD$_t$/MTHM)
			Initial kgU	

[1] Source Assembly Identifier must match the primary assembly identifier in Section C.1.1 of the current or prior data collection, whichever is applicable.

[2] The Initial Heavy Metal Content is calculated as the weight of only the number of fuel rod equivalents from assembly (reported to the nearest thousandth of a kilogram).

[3] Discharge Burnup of Source Assembly Identifier.

COMMENTS

Provide any comments you have concerning Special Fuel Form – Containers (Section C.3.1.1, C.3.1.2 and C.3.1.3) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

C.3.2 Special Fuel Form – Non-containerized Fuel Rods/Pieces

Does your facility have fuel that is not stored in a container? Include all materials that were not listed in Schedule **C.3.1** (i.e. materials to be repackaged, etc.).

_____ Yes. Complete the remainder of **Schedule C.3.2**

_____ No. Skip to **Schedule C.3.3**

For all non-containerized fuel rods and fuel pieces, provide a detailed description.

Source Assembly Identifier[1]	Number of Non-containerized Fuel Rods or Pieces from Assembly	Initial Heavy Metal Content[2]	Discharge Burnup[3] (MWD_t/MTHM)
		Initial kgU	

[1] Source Assembly Identifier must match the primary assembly identifier in Section C.1.1 of the current or prior data collection, whichever is applicable.

[2] The Initial Heavy Metal Content is calculated as the weight of only the number of fuel rod equivalents from assembly (reported to the nearest thousandth of a kilogram).

[3] Discharge Burnup of Source Assembly Identifier.

COMMENTS

Provide any comments you have concerning Special Fuel Form – Non-containerized Fuel Rods/Pieces (Section C.3.2) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

C.3.3 Special Fuel Form – Consolidated/Reconstituted/Reconstructed Assemblies; Dimensionally or Other Than LWR Non-Standard Assemblies; and Failed Fuel

C.3.3.1 Special Fuel Form – Consolidated/Reconstituted/Reconstructed Assemblies

Does your facility have consolidated/reconstituted/reconstructed assemblies? Include assemblies that have been modified by removing or replacing fuel rods.

_____ Yes. Complete the remainder of **Schedule C.3.3.1**

_____ No. Skip to **Schedule C.3.3.2**

For each consolidated/reconstituted/reconstructed assembly provide a detailed description.

Type[1]	Current Location (Assembly Identifier)	Source Assembly Identifier[2]	Number of Rods from Source Assembly (or other location)	Initial Heavy Metal Content[3] Initial kgU	Description of Assembly
Consolidated Reconstituted Reconstructed					

[1] Current Location Assembly Identifier and Source Assembly Identifier may only match if Type is Reconstructed.

[2] Source Assembly Identifier must match the primary assembly identifier in Section C.1.1 of the current or prior data collection, whichever is applicable. If source assembly is not used (i.e. reconstituted with new rods), input type of rod used. Typical examples are Stainless Steel, Depleted U rod, Natural U-235, Enriched U-235, Inert Rod, Zirc Rod, or Water Rod.

[3] The Initial Heavy Metal Content is calculated as the weight of only the number of fuel rods from source assembly.

COMMENTS

Provide any comments you have concerning Special Fuel Form – Consolidated/Reconstituted/Reconstructed Assemblies (Section C.3.3.1) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

C.3.3.2 Special Fuel Form – Dimensionally or Other Than LWR Non-Standard Assemblies

Does your facility have non-standard assemblies as defined in the Standard Contract Appendix E paragraphs B.1 *Maximum Nominal Physical Dimensions* or B.4 *Non-LWR*?

_____ Yes. Complete the remainder of **Schedule C.3.3.2**

_____ No. Skip to **Schedule C.3.3.3**

Non-standard assemblies are defined as either exceeding the maximum nominal physical dimensions specification set forth in Appendix E of the Standard Contract (also provided in table below) or being a non-light water reactor (LWR) assembly. Please provide the assembly identifier and a description of why the assembly is non-standard.

Maximum Nominal Physical Dimensions

	Reactor (BWR)	Reactor (PWR)
Overall Length	14 feet, 11 inches	14 feet, 10 inches
Active Fuel Length	12 feet, 6 inches	12 feet, 0 inches
Cross Section*	6 inches x 6 inches	9 inches x 9 inches

*The Cross Section of the fuel assembly shall not include the channel.

Non-LWR Fuel is defined as: *"Fuel from other than LWR power facilities shall be classified as Nonstandard Fuel-Class NS-4. Such fuel may be unique and require special handling, storage, and disposal facilities."*

Assembly Identifier[1]	Description of Non-Standard Assembly

[1] Assembly Identifier must match the primary assembly identifier in Section C.1.1 of the current or prior data collection, whichever is applicable.

All fuel from this reactor is considered non-standard. ☐

COMMENTS

Provide any comments you have concerning Special Fuel Form – Dimensionally or Other Than LWR Non-standard Assemblies (Section C.3.3.2) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

C.3.3.3 Special Fuel Form – Failed Fuel

Does your facility have failed fuel?

Failed Fuel Classes F-1 and F-3 are defined in the Standard Contract Appendix E. For Class F-2 *Radioactive "Leakage"* use the definition consistent with NRC NUREG-1617, Standard Review Plan for Transportation Packages for Spent Nuclear Fuel: "Damaged Spent Nuclear Fuel: spent nuclear fuel with known or suspected cladding defects greater than a hairline crack or a pinhole leak."

Note: A copy of the Standard Contract is provided in Appendix B.

_____ Yes. Complete the remainder of **Schedule C.3.3.3**

_____ No. Skip to **Schedule C.4**

For each assembly with failed fuel that is currently stored containerized or non-containerized in the pool, provide the assembly identifier and a description of why the assembly is classified as Failed Fuel.

Assembly Identifier[1]	Failed Fuel Class[2]	Description of Failure

[1] Assembly Identifier must match the primary assembly identifier in Section C.1.1 of the current or prior data collection, whichever is applicable.

[2] Chose from dropdown menu: F-1: Visual Failure or Damage; F-2: Radioactive "Leakage"; F-3: Encapsulated

COMMENTS

Provide any comments you have concerning Special Fuel Form – Failed Assemblies (Section C.3.3.3) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

C.4 Potential High-Level Waste

Has your utility entered into a contract for reprocessing any discharged fuel which will result in high level waste expected to be disposed of by the Federal Government?

____ Yes.

____ No.

C.4.1 If Yes, is this contract with a domestic or international supplier of reprocessing services?

____ Domestic

____ International

____ Both Domestic and International

C.4.2 What quantity of discharged fuel will be reprocessed?

_____ (Metric Tons)

C.4.3 Provide details as to the type of waste anticipated to be generated.

COMMENTS

Provide any comments you have concerning Potential High-Level Waste (Section C.4) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

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SCHEDULE D: STORAGE FACILITY DATA

D.1 Storage Facility Point of Contact

Provide a storage facility point of contact for verification of information provided on this form.

If contact information is the same as in Schedule A or B, insert X in the block. **A** ☐ **B** ☐

Name (First and Last): _____

Title: _____

Mailing Address: _____

_____

_____

City: _____ State: _____ Zip Code: _____

Telephone Number: _____

Email: _____

COMMENTS

Provide any comments you have concerning Storage Facility Point of Contact (Sections D.1) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

D.2 Storage Facility Information (Pool Storage)

Complete a Schedule **D.2** for each pool storage site.

D.2.1 Storage Site Identifier

_____ Storage Site Identifier

D.2.2 Storage Capacity

	Pool	Number of Assemblies	
		BWR	PWR
Current NRC Licensed Storage Capacity			
Current Installed Storage Capacity			

Current NRC Licensed Storage Capacity -- report in number of assemblies. If the site is licensed for different types of fuel (PWR, BWR), note each in the appropriate column. Note any change from previous reporting period in the comments.

Current Installed Storage Capacity -- report in number of assemblies. If the site is licensed for different types of fuel (PWR, BWR), note each in the appropriate column. Do not deduct inventory from current capacity.

Note in the comments if some of the storage capacity is unusable due to mechanical/physical limitations.

D.2.3 Storage Inventory

Storage Inventory -- Provide the number of assemblies stored at the storage site. Also enter the number of assemblies discharged from each contributing reactor that are stored at the storage site.

Contributing Reactor Name	Pool	Number of Assemblies
	Total Storage Site Inventory	

COMMENTS

Provide any comments you have concerning Storage Facility Information (Pool Storage) (Sections D.2.1, D.2.2 and D.2.3) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

D.3 Storage Facility Information (Dry Storage)

If your company has implemented a dry storage cask storage system at your site, an independent spent fuel storage installation (ISFSI), provide the following information.

D.3.1 Storage Site Identifier

_____

(See Appendix C, "Reactor or Facility and Spent Fuel Storage Site.")

D.3.2 Multi-Assembly Canisters/Casks Inventory

Number of multi-assembly canisters/casks in service _____

For each canister/cask model, provide and/or reference a loading map that clearly indicates identifiers for basket cell locations relative to fixed drain and vent port locations. For systems stored horizontally, map should indicate which direction is "up" when placed in horizontal storage module. Map reference should cite page number and figure number from either the Certificate of Compliance (CoC), a completed plant procedure, or Final Safety Analysis Report (FSAR). Provided maps should be in the form of a pdf file.

Dry Storage Canister/Cask ID	Vendor	Model Number	In Service Date[1] (MM/YYYY)	Number of Assemblies	Map Reference	Map Filename
Total Number of Assemblies in Dry Storage						

[1] In-Service date is the date when canister is placed onto a dry storage pad.

Note: If there were any anomalies or deviations from the standard operating procedures, FSAR and/or CoC experienced during the canister or cask drying, backfilling, leak test, or pad transfer processes (e.g., inadvertent stoppage of active cooling, insufficient helium backfill), provide specific details in the comment section.

COMMENTS

Provide any comments you have concerning Storage Facility Information (Dry Storage) (Sections D.3.1, D.3.2) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

D.3.3 Assemblies in Dry Storage

For each multi-assembly canister/cask, enter the assembly identifier and position according to the map for each assembly in that canister/cask. For each assembly in which non-fuel components (NFC) are stored, select each type of non-fuel component. Estimate the weight of the assembly including all the non-fuel components if present. The non-fuel component integral to an assembly specific data to be reported in D.3.3 are as follows:

Column	Description
Non-fuel Component	The type of non-fuel component that is integral to that assembly.

PWR - Control Rods	CR
BWR/PWR - Burnable Absorbers	BA
PWR - Thimble Plugs	TP
BWR/PWR - Cruciform Control Blades	CC
BWR - Fuel Channels	FC
BWR/PWR - SF Disassembly Hardware	SF
BWR/PWR - In-core Instrumentation	II
BWR/PWR - Neutron Sources	NS
BWR/PWR - Other:	Ot

Non-fuel Component Identifier	The alphanumeric characters which identified the non-fuel component that is integral to that assembly.
Estimated Total Weight	The estimated total weight of the non-fuel component plus assembly, reported in pounds

If the storage of non-fuel components within an assembly classifies that assembly as non-standard according to Appendix E of the Standard Contract, check the Yes box in the Non-standard Assembly column in C.1.1. For example, changes to an assembly's maximum physical dimensions due to the NFC may cause it to be classified as non-standard.

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Unique Canister/Cask Identifier	Assembly Identifier[1]	Position According to Map	Non-Fuel Component Type[2]	Non-Fuel Component Identifier	Damaged Fuel Can[3] (Yes/No)	Estimated Total Weight[4] (lbs)
_____						
_____						
_____						
_____						
_____						

[1] Assembly Identifier must match the primary assembly identifier in Section C.1.1 of the current or prior data collection, whichever is applicable. For a single assembly container stored in a basket cell use container identifier from Section C.3. For a container with non-fuel components use container identifier from Section E.3. List non-containerized items stored in basket cells from Sections C.3.2 and E.4 if stored in a basket cell. Describe any anomalies from standard loading arrangements in the comment section and/or provide loading map records.

[2] If the assembly has non-fuel components (NFC) stored as an integral part of the assembly, please select the type of non-fuel component(s) from the dropdown menu.

[3] Please indicate whether damaged fuel assemblies or debris are stored in a Damaged Fuel Can (DFC), referring to a canister or structural enclosure designed to securely contain and isolate damaged nuclear fuel assemblies within storage or transport casks.

[4] Estimated total weight of the assembly and including weights of NFC and/or DFC.

COMMENTS

Provide any comments you have concerning Storage Facility Information (Dry Storage) (Section D.3.3) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

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SCHEDULE E: NON-FUEL DATA

All materials not listed in Schedule C.3, Special Fuel Forms, should be included here. Non-fuel components may be integral to an assembly (enter data in Schedule C.1.1), containerized (enter data in Schedule E.3), or separate from an assembly and non-containerized in the storage pool (enter data in Schedule E.4).

E.1 Non-fuel Components

Does your facility have non-fuel components that may be delivered to a DOE facility?

_____ Yes. Complete the remainder of **Schedule E**

_____ No. Skip to **Schedule F**

Non-fuel components are defined in the Standard Contract, as including, but not limited to, burnable poison rod assemblies, control rod elements, thimble plugs, fission chambers, and primary and secondary neutron sources, that are contained within the fuel assembly, or BWR channels that are an integral part of the fuel assembly, which do not require special handling and may be included as part of the spent nuclear fuel. Note: Fuel that does not meet these specifications shall be classified as non-standard fuel.

E.2 Non-fuel Components – Integral to an Assembly

Does your facility have non-fuel components – integral to an assembly that are currently stored in spent fuel pool or dry storage that may be delivered to a DOE facility?

__ Yes. Complete the remainder of **Schedule E.2**

__ No. Skip to **Schedule E.3**

Non-fuel Components Integral to an Assembly <u>Stored in Spent Fuel Pool</u>

List the number of each applicable type of non-fuel component integral to an assembly and indicate the storage pool location from Appendix C “Reactor or Facility and Spent Fuel Storage Site”.

Type of Non-fuel Component	Number of Individual Items	Storage Location
PWR - Control Rods PWR - Thimble Plugs BWR - Cruciform Control Blades BWR - Fuel Channels BWR/PWR - Burnable Absorbers BWR/PWR - SF Disassembly Hardware BWR/PWR - In-core Instrumentation BWR/PWR - Neutron Sources BWR/PWR – Other:		

Non-fuel Components Integral to an Assembly <u>Stored in Dry Storage</u>

Report information regarding non-fuel components integral to an assembly stored in dry storage in D.3.3. E.2 is no longer used for this information and is kept as a place-holder for consistency with prior surveys. If reporting this data in D.3.3 instead of E.2 is a large burden to the respondent, please contact PNNL.

COMMENTS

Provide any comments you have concerning Non-fuel Components Integral to an Assembly (Section E.2) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

E.3 Non-fuel Components – Containerized

A container is designed to confine waste that may be delivered to a DOE facility. Report in this Schedule non-fuel components data for single assembly containers or containers which are currently stored in a storage pool or in dry storage canister from Schedule D. Data for single assembly containers that contain any spent nuclear fuel should also be reported in Schedule C.3, Special Fuel Forms.

Are there containers of non-fuel components in your pool or in dry storage canister from Schedule D that may be delivered to a DOE facility?

____ Yes. Provide the data requested in the table below for each container

____ No. Skip to **Schedule E.4**

Container Identifier	Container Shape		Container Dimensions (to nearest 0.1 inch)			Loaded Weight (lbs)[1]	Type of Non-fuel Component[2]	Number of Individual Items	Container Closure			Is Container Handled As A Standard Fuel Assembly? [3]		Storage Location[4]
	C	R	Length	Diameter/ Width	Depth				B	W	NC	Yes	No	
	❑	❑					PWR - Control Rods PWR - Thimble Plugs BWR - Cruciform Control Blades BWR - Fuel Channels BWR/PWR - Burnable Absorbers BWR/PWR - SF Disassembly Hardware BWR/PWR - In-core Instrumentation BWR/PWR - Neutron Sources BWR/PWR – Other:		❑	❑	❑	❑	❑	
	❑	❑							❑	❑	❑	❑	❑	

C = cylindrical R = rectangular B = bolted W = welded NC = not closed

[1] Loaded Weight is the weight of the container including the non-fuel components.

[2] For each container identified in Schedule E.3 in which non-fuel components are stored, list and estimate the number of each applicable type of non-fuel component that is stored in that container.

[3] Indicate whether the container may be handled as a standard fuel assembly, using the same equipment used to move assemblies.

[4] The storage location is from Appendix C, “Reactor or Facility and Spent Fuel Storage Site”.

COMMENTS

Provide any comments you have concerning Non-Fuel Data (Non-fuel Components – Containerized) (Section E.3) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

E.4 Non-fuel Components – Separate from an Assembly and Non-containerized

Does your facility have non-containerized non-fuel components that are separate from an assembly and currently stored in a storage pool or are stored in dry storage canister from Schedule D that may be delivered to a DOE facility?

_____ Yes. Complete the remainder of **Schedule E.4**

_____ No. Skip to **Schedule F**

List and provide the number of each applicable type of non-containerized non-fuel component separate from an assembly and indicate the storage pool location from Appendix C “Reactor or Facility and Spent Fuel Storage Site”. If Non-fuel Components Separate from an Assembly and Non-containerized are stored in dry storage canister from Schedule D provide canister identifier and position according to map from sections D.3.2 and D.3.3. Non-fuel components stored in GTCC containers without any fuel present should be reported in Schedule F.

Type of Non-fuel Component	Number of Individual Items	Storage Location	Cask Identifier	Position According to Map
PWR - Control Rods PWR - Thimble Plugs BWR - Cruciform Control Blades BWR - Fuel Channels BWR/PWR - Burnable Absorbers BWR/PWR - SF Disassembly Hardware BWR/PWR - In-core Instrumentation BWR/PWR - Neutron Sources BWR/PWR – Other:				

COMMENTS

Provide any comments you have concerning Non-Fuel Data (Non-fuel Components – Separate from an Assembly and Non-containerized) (Section E.4) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

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SCHEDULE F: GREATER-THAN-CLASS-C WASTE DATA

DOE is requesting information on Greater-Than-Class C waste (GTCC) inventories. GTCC is waste in which the concentrations of radionuclides exceed the limits for Class C low-level radioactive waste established by the Nuclear Regulatory Commission (NRC) in 10 CFR Part 61.55, Tables 1 and 2.

F.1 Greater-Than-Class-C Waste Point of Contact

Provide a GTCC point of contact for verification of information provided on this form.
If contact information is the same as in Schedule A or B insert X in the block.

A ☐ B ☐

Name (First and Last): _____

Title: _____

Mailing Address: _____

_____

_____

City: _____ State: _____ Zip Code: _____

Telephone Number: _____

Email: _____

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COMMENTS

Provide any comments you have concerning Greater-Than-Class-C Waste Data Point of Contact (Section F.1) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

F.2 Stored Inventory

Include in this section GTCC waste that is currently packaged and available for disposal as of December 31, 2027.

F.2.1 Activated Metals

Activated metals are removed from the reactor prior to decommissioning nuclear reactors. Portions of the reactor assembly and other components near the nuclear fuel are activated by neutrons during reactor operations, producing high concentrations of radionuclides. The major radionuclides in these wastes are typically cobalt-60, nickel-63, niobium-94, and carbon-14.

Packaged Volume (ft^3)[1]	Package Contents[2]	Packaging[3]		Package Dimensions				Loaded Weight of Package (lbs)	Date Packaged	Total Package Activity[4] (MCi)	Radionuclide[5]	Remotely Handled[6]		Date of Last Criticality (MM/YYYY)[7]	Latest Date of Segmentation (MM/YYYY)[8]
		Type	Number	External Length (in)	External Diameter (in)	External Volume (ft^3)	Internal Volume[1] (ft^3)					Yes	No		
												❑	❑		
												❑	❑		
												❑	❑		
												❑	❑		
												❑	❑		
												❑	❑		
												❑	❑		
												❑	❑		
												❑	❑		
												❑	❑		

Packaging Type options: Shielded Activated Metal Container; 55-Gallon Drum; High Integrity Container; NAC-MPC Canister; NAC-UMS Canister; NUHOMS Canister; Energy Solutions Canister; Fuel Solutions W-74 Canister; Holtec Canister; Sealed Sources; Standard Waste Box; Shipping Cask; Other: _____

Radionuclide options: C-14; C-14 in activated metal; Ni-59 in activated metal; Nb-94 in activated metal; Tc-99; I-129; Alpha emitting transuranic nuclides *; Pu-241; Cm-242; H-3; Co-60; Ni-63; Ni-63 in activated metal; Sr-90; Cs-137

[1] **Packaged Volume (ft^3):** Packaged volume corresponds to external volume of the storage container. Internal volume is the volume of the waste content.
[2] **Package Contents:** Identify the contents of each package.
[3] **Packaging Type and Number:** Provide an entry for each waste stream indicating the type of package (for other, describe what the package is) and the quantity of packages.
[4] **Total Package Activity (MCi):** Report the total activity of the package in million curies associated with the activated metals.
[5] **Radionuclide:** Report the radionuclides that account for > 1% of total activity anticipated in the waste stream.
[6] **Remotely Handled:** If the package has a dose rate of greater than 200 mrem/hr on the surface of the package, indicate if the package must be remotely handled.
[7] **Date of Last Criticality:** The date of last criticality is the date the reactor was last critical from which the metal was derived.
[8] **Latest Date of Segmentation:** For activated metal waste, indicate the date when the waste segmentation was complete.
* Alpha emitting transuranic nuclides with half-life greater than 5 years

COMMENTS

Provide any comments you have concerning GTCC Stored Inventory - Activated Metals (Section F.2.1) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

F.2.2 Process Waste/Other Waste

Process and other waste includes GTCC waste that is not activated metals. It consists of contaminated equipment, debris, trash, filters, resins, scrap metal, and decontamination and decommissioning waste.

Packaged Volume (ft^3)[1]	Package Contents[2]	Packaging[3]		Package Dimensions				Loaded Weight of Package (lbs)	Date Packaged	Total Package Activity[4] (MCi)	Radionuclide[5]	Remotely Handled[6]		Date Contents Were Removed From Service[7]	RCRA Listed Hazardous Waste Constituents or Characteristics[8]
		Type	Number	External Length (in)	External Diameter (in)	External Volume (ft^3)	Internal Volume (ft^3)					Yes	No		
											1	☐	☐		
		55-Gallon Drum									C-14	☐	☐		
		High Integrity Container									Ni-59	☐	☐		
		NAC-MPC Canister									Nb-94	☐	☐		
		NAC-UMS Canister									Tc-99	☐	☐		
		NUHOMS Canister									I-129	☐	☐		
		Energy Solutions Canister									Alpha emitting transuranic nuclides *	☐	☐		
		Fuel Solutions W-74 Canister									Pu-241	☐	☐		
		Holtec Canister									Cm-242	☐	☐		
		Sealed Sources									H-3	☐	☐		
		Standard Waste Box									Co-60	☐	☐		
		Shipping Cask									Ni-63	☐	☐		
		Other:									Sr-90	☐	☐		
											Cs-137	☐	☐		
												☐	☐		
												☐	☐		

[1] **Packaged Volume (ft^3):** Packaged volume corresponds to external volume of the storage container. Internal volume is the volume of the waste content.
[2] **Package Contents:** Identify the contents of each package (e.g., resins, filters, etc.).
[3] **Packaging Type and Number:** Provide an entry for each waste stream indicating the type of package (for other, describe what the package is) and the quantity of package**s**.
[4] **Total Package Activity (MCi):** Report the total activity of the package in million curies associated with the process waste.
[5] **Radionuclide:** Report the radionuclides that account for > 1% of total activity anticipated in the waste stream.
[6] **Remotely Handled:** If the package has a dose rate of greater than 200 mrem/hr on the surface of the package, indicate if the package must be remotely handled.
[7] **Date Contents Were Removed From Service:** For multiple dates, use the latest date.
[8] **RCRA Listed Hazardous Waste Constituents or Characteristics:** If mixed waste, list any Resource Conservation and Recovery Act (RCRA) hazardous waste constituents or characteristics.
* Alpha emitting transuranic nuclides with half-life greater than 5 years

COMMENTS

Provide any comments you have concerning GTCC Stored Inventory - Process Waste/Other Waste (Section F.2.2) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

F.3 Projected Inventory (2028-2070)

F.3.1 Activated Metals

Include GTCC waste not packaged and waste projected to be generated from licensed activities from 2028 through reactor decommissioning. Include all waste not in F.2.1.

Years Packaged	Storage Location	Description of Waste[1]	Estimated Unpackaged Volume[2] (ft^3)	Estimated Packaged Volume[3] [if known] (ft^3)
2028-2030				
2031-2040				
2041-2050				
2051-2060				
2061-2070				

[1] **Description of Waste:** Identify the specific content of the waste.

[2] **Estimated Unpackaged Volume (ft^3):** Volume of only the waste without any storage container.

[3] **Estimated Packaged Volume (ft^3):** Volume of the waste including any storage container.

COMMENTS

Provide any comments you have concerning GTCC Projected Inventory – Activated Metals (Section F.3.1) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

F.3.2 Process Waste/Other Waste

Include process and other GTCC waste not packaged and waste projected to be generated from licensed activities from 2028 through reactor decommissioning. Include all waste not in F.2.2.

Years Packaged	Storage Location	Description of Waste[1]	Estimated Unpackaged Volume[2] (ft^3)	Estimated Package Volume[3] [if known] (ft^3)	RCRA Listed Hazardous Waste Constituents or Characteristics[4]
2028-2030					
2031-2040					
2041-2050					
2051-2060					
2061-2070					

[1] **Description of Waste:** Identify the specific content of the waste. (e.g., resins, filters, etc.)

[2] **Estimated Unpackaged Volume (ft^3):** Volume of only the waste without any storage container.

[3] **Estimated Packaged Volume (ft^3):** Volume of the waste including any storage container.

[4] **RCRA Listed Hazardous Waste Constituents or Characteristics:** If mixed waste, list any Resource Conservation and Recovery Act (RCRA) hazardous waste constituents or characteristics.

COMMENTS

Provide any comments you have concerning GTCC Projected Inventory – Process Waste/Other Waste (Section F.3.2) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

Schedule and Item Number	Comment

APPENDIX A – INSTRUCTIONS FOR COMPLETING NUCLEAR FUEL DATA FORM GC-859

General Instructions

1. Purpose and Use of Data

The Form GC-859 Nuclear Fuel Data survey collects data that the DOE uses for assessing storage and disposal requirements for spent fuel, high level waste, and GTCC waste.

2. Who Should Submit

This form should be submitted by all owners and custodians of spent nuclear fuel and/or high-level radioactive waste.

3. When To Submit

This form shall be submitted by **October 31, 2028** following receipt of the form. Unless otherwise indicated, data on the form should reflect the spent fuel discharged from **January 1, 2023 - December 31, 2027**.

4. What To Submit

DOE will provide respondents with an online platform to facilitate their responses. The Form GC-859 data collection system is automated. Respondents will also be provided with electronic files to aid in the current submittal and operating instructions for the software. To the greatest extent practicable, respondents will provide data either in the data collection system or as any commonly readable, present-day electronic spreadsheet file type. If the respondent is unable to provide the data in commonly readable present-day electronic spreadsheet format, the respondent will be required to re- verify any data which is manually input by DOE.

Sign **Schedule A** and return it with your data to the address in Section 5, below.

5. Where To Submit

Please use the following website to submit your data: *https://gc859.pnnl.gov.* A signed copy of Schedule A is not required if submitting through the website.

You will receive a notice from the website confirming receipt of the files. If you have not received a confirmation notice within three business days, contact the PNNL GC-859 Survey Team at the telephone number or email provided on the cover sheet of this form.

6. Legal Authority

Data on this mandatory form are collected under authority of the Federal Energy Administration Act of 1974 (15 USC Schedule 761 et seq.), and the Nuclear Waste Policy Act of 1982 (42 USC 10101 et seq.). Data being collected on this form are not considered to be confidential.

Specific Instructions

Instructions for filing the individual Schedules of the Form GC-859 survey are included within the schedules.

Operating instructions for the software are provided with the Form GC-859 data collection system.

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APPENDIX B – GENERAL SPECIFICATION FROM APPENDIX E OF THE STANDARD CONTRACT (10 CFR 961.11)

Metric Tons Uranium:
(Initial) _____
(Discharged) _____
Range of Discharge Date(s) (Earliest to Latest)
(From approved commitment schedule)
Mo___ Day___ Yr___ to Mo___ Day___ Yr___
Number of Assemblies:
BWR _____
PWR _____
Other _____
Purchaser's Delivery First Estimate
Mo___ Day___ Yr___ last Mo___ Day___ Mo___

Unless otherwise agreed to in writing by DOE, the Purchaser shall furnish herewith to DOE suitable proof of ownership of the SNF and/or HLW to be delivered hereunder. The Purchaser shall notify DOE in writing at the earliest practicable date of any change in said ownership.

To confirm acceptability of delivery date(s):
Purchaser Contact _____
Phone _____
Title _____
DOE Contact _____
Phone _____
Title _____

Any false, fictitious or fraudulent statement may be punishable by fine or imprisonment (U.S. Code, Title 18, Section 1001).
By Purchaser:
Signature _____
Title _____
Date _____
Approved by DOE:
Technical Representative _____
Title _____
Date _____
Contracting Officer _____
Date _____

APPENDIX E

General Specifications

A. Fuel Category Identification

1. Categories—Purchaser shall use reasonable efforts, utilizing technology equivalent to and consistent with the commercial practice, to properly classify Spent Nuclear Fuel (SNF) prior to delivery to DOE, as follows:

a. *Standard Fuel* means SNF that meets all the General Specifications therefor set forth in paragraph B below.

b. *Nonstandard Fuel* means SNF that does not meet one or more of the General Specifications set forth in subparagraphs 1 through 5 of paragraph B below, and which is classified as Nonstandard Fuel Classes NS–1 through NS–5, pursuant to paragraph B below.

c. *Failed Fuel* means SNF that meets the specifications set forth in subparagraphs 1 through 3 of paragraph B below, and which is classified as Failed Fuel Class F–1 through F–3 pursuant to subparagraph 6 of paragraph B below.

d. Fuel may have "Failed Fuel" and/or several "Nonstandard Fuel" classifications

B. Fuel Description and Subclassification—General Specifications

1. *Maximum Nominal Physical Dimensions.*

	Boiling water reactor (BWR)	Pressurized water reactor (PWR)
Overall Length	14 feet, 11 inches	14 feet, 10 inches.
Active Fuel Length	12 feet, 6 inches ..	12 feet, 0 inches.
Cross Section[1]	6 inches × 6 inches.	9 inches × 9 inches.

[1] The cross section of the fuel assembly shall not include the channel.

NOTE: Fuel that does not meet these specifications shall be classified as Nonstandard Fuel—Class NS–1.

2. *Nonfuel Components.* Nonfuel components including, but not limited to, control spiders, burnable poison rod assemblies, control rod elements, thimble plugs, fission chambers, and primary and secondary neutron sources, that are contained within the fuel assembly, or BWR channels that are an integral part of the fuel assembly, which do not require special handling, may be included as part of the spent nuclear fuel delivered for disposal pursuant to this contract.

NOTE: Fuel that does not meet these specifications shall be classified as Nonstandard Fuel—Class NS–2.

3. *Cooling.* The minimum cooling time for fuel is five (5) years.

NOTE: Fuel that does not meet this specification shall be classified as Nonstandard Fuel—Class NS–3.

4. *Non-LWR Fuel.* Fuel from other than LWR power facilities shall be classified as Nonstandard Fuel—Class NS–4. Such fuel may be unique and require special handling, storage, and disposal facilities.

5. *Consolidated Fuel Rods.* Fuel which has been disassembled and stored with the fuel rods in a consolidated manner shall be classified as Nonstandard Fuel Class NS–5.

6. *Failed Fuel.*

a. Visual Inspection.

Assemblies shall be visually inspected for evidence of structural deformity or damage to cladding or spacers which may require special handling. Assemblies which [i] are structurally deformed or have damaged cladding to the extent that special handling may be required or [ii] for any reason cannot be handled with normal fuel handling equipment shall be classified as Failed Fuel—Class F–1.

b. Previously Encapsulated Assemblies.

Assemblies encapsulated by Purchaser prior to classification hereunder shall be classified as Failed Fuel—Class F–3. Purchaser shall advise DOE of the reason for the

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prior encapsulation of assemblies in sufficient detail so that DOE may plan for appropriate subsequent handling.

c. Regulatory Requirements.

Spent fuel assemblies shall be packaged and placed in casks so that all applicable regulatory requirements are met.

C. Summary of Fuel Classifications

1. *Standard Fuel:*
a. Class S–1: PWR
b. Class S–2: BWR
2. *Nonstandard Fuel:*
a. Class NS–1: Physical Dimensions
b. Class NS–2: Non Fuel Components
c. Class NS–3: Short Cooled
d. Class NS–4: Non-LWR
e. Class NS–5: Consolidated Fuel Rods.
3. *Failed Fuel:*
a. Class F–1: Visual Failure or Damage
b. Class F–2: Radioactive ''Leakage''
c. Class F–3: Encapsulated

D. High-Level Radioactive Waste

The DOE shall accept high-level radioactive waste. Detailed acceptance criteria and general specifications for such waste will be issued by the DOE no later than the date on which DOE submits its license application to the Nuclear Regulatory Commission for the first disposal facility.

APPENDIX F

Detailed Description of Purchaser's Fuel

This information shall be provided by Purchaser for each distinct fuel type within a Shipping Lot not later than sixty (60) days prior to the schedule transportation date.

Purchaser _____
Contract Number/Date ___/_____
Reactor/Facility Name__ _____
_____
_____

I. Drawings included in generic dossier: _____

1. Fuel Assembly DWG# ___
2. Upper & Lower end fittings DWG# ___
Dossier Number: ___
DOE Shipping Lot #: ___
Assemblies Described:

_____BWR
_____PWR
_____Other

II. *Design Material Descriptions.*

Fuel Element:

1. Element type ___ (rod, plate, etc.)
2. Total length) ___/(in.)
3. Active length ___ (in.)
4. Cladding material ___ (Zr, s.s., etc.)

Assembly Description:

1. Number of Elements ___
2. Overall dimensions (length ___ (cross section) ___ (in.)
3. Overall weight ___

III. Describe any distortions, cladding damage or other damage to the spent fuel, or nonfuel components within this Shipping Lot which will require special handling procedures. (Attach additional pages if needed.)

_____
_____

IV. Assembly Number ___
Shipping Lot #___

	Irradiation history cycle No.				
	1	2	3	4	5
1. Startup date (mo/day/yr)	.....	.....	.....	.....	.....
2. Shutdown date (mo/day/yr)	.....	.....	.....	.....	.....
3. Cumulative fuel exposure (mwd/mtu)	.....	.....	.....	.....	.....
4. Avg. reactor power (mwth)	.....	.....	.....	.....	.....

5. Total heat output/assembly in watts, using an approved calculational method: _____ as of Date _____

Any false, fictitious or fradulent statement may be punishable by fine or imprisonment (U.S. Code, Title 18, Section 1001).

By Purchaser:
Signature _____
Title _____
Date _____

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APPENDIX C – REACTOR OR FACILITY AND SPENT FUEL STORAGE SITE

Power Reactor or Facility Names	On-Site Storage Location(s)
Aerotest	Aerotest
Arkansas Nuclear One - Units 1 and 2	Arkansas Nuclear One 1 Pool
	Arkansas Nuclear One 2 Pool
	Arkansas Nuclear One ISFSI
Beaver Valley - Units 1 and 2	Beaver Valley 1 Pool
	Beaver Valley 2 Pool
	Beaver Valley ISFSI
Big Rock Point	Big Rock Point ISFSI
Braidwood - Units 1 and 2	Braidwood 1 and 2 Pool (CP)
	Braidwood ISFSI
Browns Ferry - Units 1, 2, and 3	Browns Ferry 1 and 2 Pool (TC)
	Browns Ferry 3 Pool
	Browns Ferry ISFSI
Brunswick 1 and 2	Brunswick 1 Pool
	Brunswick 2 Pool
	Brunswick ISFSI
BWXT Lynchburg Research Center	BWXT Lynchburg Research Center
Byron - Units 1 and 2	Byron 1 and 2 Pool (CP)
	Byron ISFSI
Callaway	Callaway Pool
	Callaway ISFSI
Calvert Cliffs - Units 1 and 2	Calvert Cliffs 1 and 2 Pool (TC)
	Calvert Cliffs ISFSI
Catawba - Units 1 and 2	Catawba 1 Pool
	Catawba 2 Pool
	Catawba ISFSI

Power Reactor or Facility Names	On-Site Storage Location(s)
Clinton 1	Clinton 1 Pool
	Clinton ISFSI
Columbia	Columbia Pool
	Columbia ISFSI
Comanche Peak - Units 1 and 2	Comanche Peak 1 and 2 Pool (TC)
	Comanche Peak ISFSI
Cook - Units 1 and 2	Cook 1 and 2 Pool (CP)
	Cook ISFSI
Cooper	Cooper Station Pool
	Cooper Station ISFSI
Crystal River 3	Crystal River 3 ISFSI
Davis-Besse	Davis-Besse Pool
	Davis-Besse ISFSI
Diablo Canyon - Units 1 and 2	Diablo Canyon 1 Pool
	Diablo Canyon 2 Pool
	Diablo Canyon ISFSI
Dow	Dow
Dresden - Units 1, 2, and 3	Dresden 2 Pool
	Dresden 3 Pool
	Dresden ISFSI
Duane Arnold	Duane Arnold Pool
	Duane Arnold ISFSI

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Power Reactor or Facility Names	On-Site Storage Location(s)
Enrico Fermi 2	Enrico Fermi 2 Pool
	Enrico Fermi 2 ISFSI
Farley - Units 1 and 2	Farley 1 Pool
	Farley 2 Pool
	Farley ISFSI
Fitzpatrick	Fitzpatrick Pool
	Fitzpatrick ISFSI
Fort Calhoun	Fort Calhoun ISFSI
Fort St. Vrain	Fort St. Vrain ISFSI
Ginna	Ginna Pool
	Ginna ISFSI
General Atomics	n/a
Grand Gulf	Grand Gulf Pool
	Grand Gulf ISFSI
Haddam Neck	Haddam Neck ISFSI
Harris	Harris Pools (TC)
Hatch - Units 1 and 2	Hatch 1 and 2 Pool (TC)
	Hatch ISFSI
Hope Creek	Hope Creek Pool
	Salem/Hope Creek ISFSI
Humboldt Bay	Humboldt Bay ISFSI
Idaho National Laboratory	Idaho National Laboratory
Indian Point - Units 1, 2, and 3	Indian Point 2 and 3 Pool (TC)
	Indian Point ISFSI

Power Reactor or Facility Names	On-Site Storage Location(s)
Kewaunee	Kewaunee (ISFSI)
LaSalle - Units 1 and 2	LaSalle County 1 and 2 Pool (TC)
	LaSalle County ISFSI
LaCrosse	LaCrosse ISFSI
Limerick - Units 1 and 2	Limerick 1 and 2 Pool (TC)
	Limerick ISFSI
Maine Yankee	Maine Yankee ISFSI
McGuire - Units 1 and 2	McGuire 1 Pool
	McGuire 2 Pool
	McGuire ISFSI
Millstone - Units 1, 2, and 3	Millstone 1 Pool
	Millstone 2 Pool
	Millstone 3 Pool
	Millstone ISFSI
Monticello	Monticello Pool
	Monticello ISFSI
Morris Operations	Morris Pool ISFSI
Nine Mile Point - Units 1 and 2	Nine Mile Point 1 Pool
	Nine Mile Point 2 Pool
	Nine Mile Point ISFSI
North Anna - Units 1 and 2	North Anna 1 and 2 Pool (CP)
	North Anna ISFSI

Power Reactor or Facility Names	On-Site Storage Location(s)
Oconee - Units 1, 2, and 3	Oconee 1 and 2 Pool (CP)
	Oconee 3 Pool
	Oconee ISFSI
Oyster Creek	Oyster Creek ISFSI
Pacific Northwest National Laboratory	Pacific Northwest National Laboratory
Palisades	Palisades Pool
	Palisades ISFSI
Palo Verde - Units 1, 2, and 3	Palo Verde 1 Pool
	Palo Verde 2 Pool
	Palo Verde 3 Pool
	Palo Verde (ISFSI)
Peach Bottom - Units 2 and 3	Peach Bottom 2 Pool
	Peach Bottom 3 Pool
	Peach Bottom ISFSI
Perry	Perry 1 Pool
	Perry ISFSI
Pilgrim	Pilgrim ISFSI
Point Beach - Units 1 and 2	Point Beach 1 and 2 Pool (CP)
	Point Beach ISFSI
Prairie Island - Units 1 and 2	Prairie Island 1 and 2 Pool (CP)
	Prairie Island ISFSI
Quad Cities - Units 1 and 2	Quad Cities 1 and 2 Pool (TC)
	Quad Cities (ISFSI)
Rancho Seco	Rancho Seco ISFSI
River Bend 1	River Bend 1 Pool
	River Bend ISFSI

Power Reactor or Facility Names	On-Site Storage Location(s)
H.B. Robinson	H. B. Robinson Pool
	H. B. Robinson ISFSI
Saint Lucie - Units 1 and 2	St. Lucie 1 Pool
	St. Lucie 2 Pool
	St. Lucie ISFSI
Salem - Units 1 and 2	Salem 1 Pool
	Salem 2 Pool
	Salem/Hope Creek ISFSI
San Onofre - Units 1, 2, and 3	San Onofre ISFSI
Savannah River Site	Savannah River Site
Seabrook	Seabrook Pool
	Seabrook ISFSI
Sequoyah - Units 1 and 2	Sequoyah 1 and 2 Pool (CP)
	Sequoyah ISFSI
South Texas Project - Units 1 and 2	South Texas Project 1 Pool
	South Texas Project 2 Pool
	South Texas Project ISFSI
Summer	Summer Pool
	Summer ISFSI
Surry - Units 1 and 2	Surry 1 and 2 Pool (CP)
	Surry ISFSI

Power Reactor or Facility Names	On-Site Storage Location(s)
Susquehanna - Units 1 and 2	Susquehanna 1 and 2 Pool (TC)
	Susquehanna ISFSI
Three Mile Island - Unit 1	Three Mile Island 1 Pool
	Three Mile Island ISFSI
Three Mile Island - Unit 2	Three Mile Island 2 Pool
	Three Mile Island ISFSI
Trojan	Trojan ISFSI
Turkey Point - Units 3 and 4	Turkey Point 3 Pool
	Turkey Point 4 Pool
	Turkey Point ISFSI
Vallecitos Nuclear Center	Vallecitos Nuclear Center
Vermont Yankee	Vermont Yankee ISFSI
Vogtle - Units 1 and 2	Vogtle 1 and 2 Pools (TC)
	Vogtle ISFSI
Washington Hanford	Washington Hanford
Waterford 3	Waterford 3 Pool
	Waterford 3 ISFSI
Watts Bar - Units 1 and 2	Watts Bar 1 and 2 Pool (CP)
	Watts Bar ISFSI
Wolf Creek	Wolf Creek 1 Pool
	Wolf Creek ISFSI
Yankee Rowe	Yankee Rowe ISFSI
Zion - Units 1 and 2	Zion ISFSI

CP: Common Pool Serving Two or More Reactors
ISFSI: Independent Spent Fuel Storage Installation
ISFSI references are for dry cask storage unless otherwise noted.
TC: Transfer Canal

APPENDIX D – GLOSSARY OF TERMS

Activated Metals: Activated metals result from decommissioning nuclear reactors. Portions of the reactor assembly and other components near the nuclear fuel are activated by neutrons during reactor operations, producing high concentrations of radionuclides. The major radionuclides in these wastes are typically cobalt-60, nickel-63, niobium-94, and carbon-14.

ANSI Assembly Identifier: The serial numbering scheme adopted by the American National Standards Institute (ANSI) to ensure uniqueness of an assembly serial number.

Assembly-Average Initial Enrichment: Initial enrichment averaged across the entire assembly. This average should include axial blankets, and axially and radially zoned enrichments.

Assembly Identifier: A unique string of alphanumeric characters which identifies an assembly, bundle, or canister for a specific reactor in which it has been irradiated. This identifier should be consistent with other submissions to the DOE/NRC, i.e., previous Form RW-859 and DOE/NRC Form 741.

Average Assembly Weight: Average initial loading weight in kilograms (kg) of heavy metal of fresh fuel assemblies in a batch before they are initially inserted into the reactor core.

Average Discharge Burnup: The average amount of energy produced by each assembly in a batch of spent fuel assemblies discharged from a nuclear reactor, reported in thousand megawatt days thermal per metric ton of uranium (MWD_t/MTHM).

Basket: An open container into which fuel and/or non-fuel components including rods, sections of rods, fuel pellets, garbage, debris, etc., are placed. Baskets are usually defined as rodlet or garbage and debris containers with dimensions less than that of a fuel assembly.

Batch: A batch (or group) is a logical grouping of assemblies with similar characteristics. All assemblies in a batch have the same initial assembly-average enrichment, the same cycle/reactor history, the same current location, the same burnup, the same owner, and the same assembly design characteristics.

Boiling Water Reactor (BWR): A light water reactor in which water, used as both coolant and moderator, is allowed to boil in the core. The resulting steam is used directly to drive a turbine.

Burnup: Amount of thermal energy generated per unit mass of fuel, measured in units of megawatt days thermal per initial metric ton of uranium (MWD_t/MTHM).

Container: A single assembly container is defined as any container designed to confine waste that may be delivered to a DOE facility**.** A container has dimensions that fit within the envelope defined by the Standard Contract and can be handled similar to an assembly.

Cell: A physical position in a rack in a storage pool or a dry storage module, which is intended to be occupied by an assembly or equivalent (that is, a container or an assembly skeleton).

Consolidated Assembly: Fuel rods are removed from an assembly and placed into a container in a grid with spacing closer than that of an assembly.

Core: The place in the reactor in which the nuclear fuel is irradiated and thermal energy is generated.

Core Size: The fixed number of fuel assemblies that can be irradiated at any one time in the reactor core.

Current Installed Capacity: Total number of assembly storage cells in the spent nuclear fuel pool. Both occupied and unoccupied cells are included in the current capacity.

Current Inventory: Number of spent nuclear fuel assemblies stored at a given site or spent nuclear fuel pool, at a given point in time.

Cycle: For the purposes of this form, a cycle is the time period beginning with the startup of a reactor after refueling (or initial fueling) to the time the reactor is considered subcritical. Refueling times should not be included in cycle lengths.

Damaged Fuel Can (DFC): Damaged Fuel Can is a general term referring to a canister or structural enclosure designed to securely contain and isolate damaged nuclear fuel assemblies within storage or transport casks. These systems ensure the safe handling, storage, and transportation of fuel with structural defects, compromised cladding, or missing components while preventing the release of radioactive material.

DOE Facility: The term DOE facility means a facility operated by or on behalf of DOE for the purpose of disposing of spent nuclear fuel and/or high-level radioactive waste, or such other facility(ies) to which spent nuclear fuel and/ or high-level radioactive waste may be shipped by DOE prior to its transportation to a disposal facility.

Enrichment: A nuclear fuel cycle process in which the concentration of the fissile uranium-235 (U-235) isotope is increased above its natural level.

Failed Fuel: Failed Fuel Class F-1 *Visual Failure or Damage* and Class F-3 *Encapsulated* are defined in the Standard Contract Appendix E. For Class F-2 *Radioactive "Leakage"* use the definition consistent with NRC NUREG-1617, Standard Review Plan for Transportation Packages for Spent Nuclear Fuel: "Damaged Spent Nuclear Fuel: spent nuclear fuel with known or suspected cladding defects greater than a hairline crack or a pinhole leak"

Fuel Assembly: The basic unit of nuclear fuel. Uranium dioxide (UO_2) pellets are encased in cladding to form a fuel rod. Fuel rods are structurally connected to form a fuel assembly.

Fuel Cycle: The length of time a reactor is operated between refueling, typically 18 to 24 months, including the refueling time, measured from the startup of one cycle to the startup of the following cycle.

Greater Than Class C (GTCC) Waste: Greater-Than-Class-C waste (GTCC) is generated by licensees of the NRC. The waste has concentrations of certain radionuclides above the Class C limits as stated in 10 CFR 61.55. Most forms of GTCC waste are generated by routine operations at nuclear power plants. Examples of GTCC waste could include activated metal hardware (e.g., nuclear power reactor control rods), spent fuel disassembly hardware, ion exchange resins, filters and evaporator residues.

High-Level Radioactive Waste (HLW): (A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and (B) other highly radioactive material that the [Nuclear Regulatory] Commission, consistent with existing law, determines by rule requires permanent isolation.

High-Temperature, Gas-Cooled Reactor (HTGR): A reactor that is cooled by helium and moderated by graphite.

Independent Spent Fuel Storage Installation (ISFSI): A dry storage complex designed and constructed for the interim storage of spent nuclear fuel; solid, reactor-related, greater than Class C waste; and other associated radioactive materials. A spent fuel storage facility may be considered independent, even if it is located on the site of another NRC-licensed facility.

Initial Enrichment: The isotopic percentage of uranium-235, by weight, in uranium that is present in unirradiated (fresh) nuclear fuel.

Initial Loading Weight: Average weight in kilograms (kg) of heavy metal in a fresh fuel assembly before it is inserted into the reactor core.

Lattice Size: Lattice is the arrangement or array of fuel rods in a nuclear fuel assembly.

Light Water Reactor (LWR): A nuclear reactor that uses water as the primary coolant and moderator, with slightly enriched uranium as fuel. There are two types of commercial light water reactors: the boiling water reactor (BWR) and the pressurized water reactor (PWR).

Maximum Planar-Average Initial Enrichment: The highest average initial enrichment through any cross-sectional plane of the assembly.

Multi-Assembly Canister/Cask: A container capable of holding multiple assemblies that is designed and licensed for storage purposes.

Non-fuel Components (NFC): As defined in the Standard Contract Appendix E Section B.2.

Non-fuel Component Identifier: A string of alphanumeric characters which identifies a non-fuel component.

Non-standard Fuel: As defined in the Standard Contract Appendix E Section A.1.b.

NRC Licensed Site Capacity: Maximum number of spent nuclear fuel assembly and canister slots licensed for use at a given site or spent nuclear fuel pool, as licensed by the Nuclear Regulatory Commission.

Nuclear Fuel: Fissionable materials that are enriched to such a composition that when placed in a nuclear reactor will support a self-sustaining fission chain reaction, producing heat in a controlled manner for process use.

Permanently Discharged Fuel: Spent nuclear fuel for which there are no plans for reinsertion in the reactor core.

Pool Site: One or more spent fuel storage pools, which have a single cask loading area. Dry cask storage areas are considered separate sites.

Pressurized Water Reactor (PWR): A light water reactor in which heat is transferred from the core to a heat exchanger via water kept under high pressure, so that high temperatures can be maintained in the primary system without boiling the water. Steam is generated in a secondary circuit.

Process Waste: Process and other waste includes Greater than Class C (GTCC) waste that is not activated metals or sealed sources. It consists of contaminated equipment, debris, trash, filters, resins, scrap metal, and decontamination and decommissioning waste.

Radioactivity: The rate at which radioactive material emits radiation, stated in terms of the number of nuclear disintegrations occurring per unit of time; the basic unit of radioactivity is the curie.

Radionuclide: An unstable isotope of an element that decays or disintegrates spontaneously, thereby emitting radiation. Approximately 5,000 natural and artificial radioisotopes have been identified.

Reconstituted Fuel: Spent nuclear fuel assembly which has had a defective rod or rods removed and replaced with another rod or rods. The recipient fuel assembly is intended to be reinserted into a subsequent fuel cycle.

Reconstructed Assembly: Spent nuclear fuel assembly which has fuel rods transferred from a damaged assembly to a new assembly skeleton.

Refueling: The process of shutting down a reactor and replacing some of the spent nuclear fuel assemblies.

Reinserted Fuel: Irradiated fuel that is discharged in one cycle and inserted in the same reactor during a subsequent refueling. In a few cases, fuel discharged from one reactor has been used to fuel a different reactor.

Shutdown Date: Day, month, and year of shutdown for fuel discharge and refueling. The date should be the point at which the reactor became subcritical.

Source Assembly: The originating fuel assembly from which fuel rods used in consolidation, reconstitution, or reconstruction are obtained.

Spent Fuel Disassembly (SFD) Hardware: The skeleton of a fuel assembly after the fuel rods have been removed. Generally, SFD hardware for PWR assemblies includes guide tubes; instrument tubes; top and bottom nozzles; grid spacers; hold-down springs; and attachment components, such as nuts and locking caps. For BWR fuel assemblies, SFD hardware includes the top and bottom tie plates, compression springs for individual fuel rods, grid spacers, and water rods.

Standard Contract: The agreement (as set forth in 10 CFR Part 961.11) between the Department of Energy (DOE) and the owners or generators of spent nuclear fuel and high-level radioactive waste.

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OMB NO. 1901-0287
Expiration Date: 08/31/2029
Burden: 90 Hours

Standard Fuel: As defined in the Standard Contract Appendix E Section A.1.a.

Storage Site ID: Spent nuclear fuel storage pool or dry cask storage facility, usually located at the reactor site, as licensed by the Nuclear Regulatory Commission (NRC).

Temporarily Discharged Fuel: Fuel which was irradiated in the previous fuel cycle (cycle N) and not in the following fuel cycle (cycle N+1), and for which there are definite plans to irradiate in a subsequent fuel cycle.

OMB NO. 1901-0287
Expiration Date: 08/31/2029
Burden: 90 Hours

APPENDIX E – FUEL ASSEMBLY TYPE CODES

E.1 Babcock and Wilcox (B&W) Reactors

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva	Mark B-HTP	High thermal performance (HTP) spacers; FUELGUARD™ lower tie plate	B1515AH
B&W	Mark B	B&W-manufactured fuel for B&W 15 x 15 reactors; Mark B is a generic designation and is used when the specific assembly type is unknown; ~464 kg U.	B1515B
B&W	Mark B10	Mark B9 features; cruciform leaf-springs on redesigned upper end fitting, zone-loaded fuel enrichment variations.	B1515B10
B&W	Mark B11	Plug-in-grid debris filter, reduced diameter fuel rod (0.416"), M5 cladding, quick disconnect upper end fitting, flow mixing grids.	B1515B11
B&W	Mark B12	Heavy loaded fuel rod (0.430" diameter), M5 cladding and guide tubes, optional quick disconnect upper end fitting.	B1515B12
B&W	Mark B2	B&W-manufactured fuel for B&W 15 X 15 reactors; Mark B2 fuel uses a corrugated flexible grid spacer and a zirconium dioxide solid spacer between the fuel column and the fuel rod end plug; ~464 kg U.	B1515B2
B&W	Mark B3	B&W-manufactured fuel for B&W 15 X 15 reactors; Mark B3 characteristics are not well defined because it is an early fuel design; ~464 kg U.	B1515B3
B&W	Mark B4	B&W-manufactured fuel for B&W 15 X 15 reactors; standard fuel from B&W for many years; Inconel spacer grids; ~464 kg U.	B1515B4
B&W	Mark B4Z	B&W-manufactured fuel for B&W 15 X 15 reactors; features 6 Zircaloy grid spacers in the core zone; ~464 kg U.	B1515B4Z
B&W	Mark B5	B&W-manufactured fuel for B&W 15 X 15 reactors; redesigned upper end fitting eliminates retainers for Burnable Poison Rod Assembly holddown; redesigned holddown spring made of Inconel 718 rather than Inconel X-750; ~464 kg U.	B1515B5
B&W	Mark B5Z	B &W manufactured fuel for B&W 15 X 15 reactors; assemblies features 6 Zircaloy acid spacers in the core zone, a redesigned upper end fitting which eliminates the retainers for Burnable Poison Rod Assembly holddown, and a redesigned holddown spring made of Inconel 718 rather than Inconel X 750; ~464 kg U.	B1515B5Z
B&W	Mark B6	B&W-manufactured fuel for B&W 15 X 15 reactors; assemblies feature 6 Zircaloy grid spacers in the core zone and a skirtless and removable upper end fitting; ~464 kg U.	B1515B6
B&W	Mark B7	B&W-manufactured fuel for B&W 15 X 15 reactors; in addition to the Mark B6 fuel, the Mark B7 features slightly longer fuel rods and a shorter lower end fitting; these features increase the plenum volume and fuel rod to nozzle gap, allowing for increasing discharged burnups; ~464 kg U.	B1515B7

Vendor	Fuel Design	Distinguishing Features	FA Type Code
B&W	Mark B8	B&W-manufactured fuel for B&W 15 X 15 reactors; in addition to the features of Mark B7 fuel, the Mark B8 fuel has a debris fretting resistant fuel rod design; ~464 kg U.	B1515B8
B&W	Mark B9	B&W-manufactured fuel for B&W 15 X 15 reactors; Mark B8 features plus slightly increased pellet diameter and reduced stack length; ~464 kg U.	B1515B9
B&W	Mark B9Z	B&W-manufactured fuel for B&W 15 X 15 reactors. Zone-loaded fuel, skirtless lower end grid, and the use of optimized flow guide tubes.	B1515B9Z
B&W	Mark BGd	B&W-manufactured fuel for B&W 15 X 15 reactors; used as lead test assemblies at Oconee 1; this fuel utilized gadolinia in the fuel rods as a neutron absorber; apparently had removed upper end fittings, the forerunner of the skirtless (Mark B6) upper end fitting; ~430 kg U.	B1515BGD
B&W	Zirc Grids	B&W manufactured fuel for B&W 15 X 15 reactors; generic designation for fuels for Zircaloy grid spacers which encompasses Mark B4Z, B5Z, B6, B7 and B8 fuels when specific assembly type has not been determined; ~464 kg U.	B1515BZ
W		W-manufactured fuel for B&W 15x15 reactors.	B1515W
B&W	Mark C	B&W manufactured fuel for B&W 17 X 17 reactors; test assemblies used at Oconee 1, 2 & 3; ~456 kg U.	B1717B

E.2 Combustion Engineering (CE), 14x14 Fuel

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva (ANF)		ANF-manufactured fuel for CE 14 x 14 reactors.	C1414A
Areva	HTP	M5 Cladding, Advanced fuel rod geometry, Z-4 MONOBLOC™ guide tubes	C1414AH
Areva	"Advanced" HTP	Areva-manufactured fuel for CE 14 x 14 reactors. Features include M5 Cladding, Advanced fuel rod geometry, HTP spacer grids, Z-4 MONOBLOC™ guide tubes; gadolinia burnable absorbers, FUELGUARD™ bottom nozzle	C1414AHA
CE		CE fuel for CE 14 x 14 reactors, manufactured in Hematite, MO.	C1414C
W		W fuel for CE 14 x 14 reactors, manufactured in Columbia, SC.	C1414W
W	Turbo	CE/W fuel for CE 14 x 14 reactors, with flow mixers on the spacer grids and I-springs.	C1414WT

E.3 Combustion Engineering (CE), 16x16 Fuel

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva	HTP	Areva-manufactured fuel for CE 16 x 16 reactors. Features include M5 Cladding, Advanced fuel rod geometry, HTP spacer grids, Z-4 MONOBLOC™ guide tubes; gadolinia burnable absorbers, FUELGUARD™ bottom nozzle	C1616AH
CE		CE fuel for CE 16 x 16 reactors, manufactured in Hematite, MO.	C1616C
W		W fuel for CE 16 x 16 reactors, manufactured in Columbia, SC.	C1616W
W	NGF	W-manufactured Next Generation Fuel for CE 16 x 16 reactors. Features include fuel rods with a 0.374" diameter and Optimized ZIRLO™ cladding; intermediate flow mixers; ZrB_2 integral burnable absorbers and axial blankets; GUARDIAN™ bottle nozzles and longer, solid fuel rod lower end plug.	C1616WN

E.4 Combustion Engineering (CE) System 80

Vendor	Fuel Design	Distinguishing Features	FA Type Code
CE		CE fuel for CE System 80 reactors, manufactured in Hematite, MO.	C8016C
W		W fuel for CE System 80 reactors, manufactured in Columbia, SC.	C8016W
W	NGF	W-manufactured Next Generation Fuel for CE System 80 reactors. Features include fuel rods with a 0.374" diameter and Optimized ZIRLO™ cladding; intermediate flow mixers; ZrB_2 integral burnable absorbers and axial blankets; GUARDIAN™ bottle nozzles and longer, solid fuel rod lower end plug.	C8016WN

E.5 General Electric (GE) BWR/2 and BWR/3

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva (ANF)		ANF-manufactured fuel for GE BWR/2,3 reactors; 7 X 7 fuel rod array; used only at Oyster Creek; ~182 kg U.	G2307A
GE	GE-2a	GE-manufactured fuel for GE BWR/2,3 reactors; original core fuel at Oyster Creek, Nine Mile Point 1, and Millstone 1; fuel rod diameter of 0.570”; ~195 kg U.	G2307G2A
GE	GE-2b	GE-manufactured fuel for GE BWR/2,3 reactors; original core fuel at other reactors; fuel rod diameter of 0.563"; cladding thickness of 0.032"; ~193 kg U.	G2307G2B
GE	GE-3	GE-manufactured fuel for GE BWR/2,3 reactors; "improved" fuel; cladding thickness of 0.037"; hydrogen getter introduced; ~188 kg U.	G2307G3
Areva (ANF)		ANF-manufactured fuel for GE BWR/2,3 reactors; 8 X 8 fuel rod array; 1 water rod; estimated 175 kg U.	G2308A
Areva (ANF)		ANF-manufactured fuel for GE BWR/2,3 reactors; rods prepressurized with He to several atmospheres; ~175 kg U.	G2308AP
GE	GE-10	GE-manufactured fuel for GE BWR/2,3 reactors; fuel channel is 100 mils thick at corners and 65 mils thick on sides reducing the parasitic material in core; uses flow directors on the inside of the channel thus redirecting the flow of water away from the channel wall and toward the center of the fuel bundle; estimated 172 kg U.	G2308G10
GE	GE-4	GE-manufactured fuel for GE BWR/2,3 reactors; first 8 X 8 fuel; 1 water rod; ~184 kg U.	G2308G4
GE	GE-5	GE-manufactured fuel for GE BWR/2,3 reactors; "retrofit" fuel; 2 water rods; natural uranium axial blankets; ~177 kg U.	G2308G5
GE	GE-8a	GE-manufactured fuel for GE BWR/2,3 reactors; features of GE BWR/2,3 8 X 8 fuel with only 2 water rods; ~177 kg U.	G2308G8A
GE	GE-8b	GE-manufactured fuel for GE BWR/2,3 reactors; 4 water rods; introduces axially zoned enrichments and burnable absorbers; fuel rod prepressurization increased to 5 atmospheres; ~172 kg U.	G2308G8B
GE	GE-9	GE-manufactured fuel for GE BWR/2,3 reactors; ferule type spacer grids; large diameter water rod which displaces 4 fuel rod positions; axially zoned enrichment and burnable absorbers; fuel rod prepressurization of 5 atmospheres; “barrier” cladding; ~172 kg U.	G2308G9
GE	Barrier	GE-manufactured fuel for GE BWR/2,3 reactors; pure zirconium "barrier" on inside of cladding to reduce pellet-clad interaction; ~177 kg U.	G2308GB
GE	Pre-pres.	GE-manufactured fuel for GE BWR/2,3 reactors; fuel rods prepressurized to 3 atmospheres He; 2 water rods; ~177 kg U.	G2308GP

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva (ANF)		ANF-manufactured fuel for GE BWR/2,3 reactors; 9X9 fuel rod array; 2 water rods; ~168 kg U.	G2309A
Areva (ANF)	ANF IX	ANF-manufactured fuel for GE BWR/2,3 reactors; uses a central water channel that replaces 9 rods; the regular fuel rods in the IX version utilize an internal cladding liner of pure zirconium; estimated 169 kg U.	G2309AIX
Areva	Atrium-10XM	Unique pellet end; Improved FUELGUARD™ filter; 9 inconel-718 ULTRAFLOW™ Type 62 spacer grids; secure quick-disconnect end fitting; 12 part-length fuel rods; 5 water channel crowns; 10.28 mm fuel rod diameter	G2310AXM
GNF	GE11	9x9 bundle, with 74 fuel rods (66 full-length and 8 part-length rods) and 2 large water rods.	G2309G11
GNF	GE12	10x10 bundle, with 92 fuel rods (78 full-length and 14 part-length rods) and 2 large water rods. Adds 8th spacer grid.	G2310G12
GNF	GE14	10x10 bundle, with 92 fuel rods (78 full-length and 14 part-length rods) and 2 large water rods. Adds 8th spacer grid. No ferrules in top 3 spacers above part length rods.	G2310G14
GNF	GNF2	Defender™ debris filter; advanced spacer design with reduced thickness inconel grids and flow wings; multiple sizes of part-length fuel rods; increased plenum volume and high mass fuel pellets; and simplified channels.	G2310GG2
W	Optima2	10x10 fuel lattice with 96 fueled rods, including 84 regular full-length rods, 8 long part-length rods, and 4 short part-length rods; water cross with centralized water channel.	G2310WO2

E.6 General Electric (GE) BWR/4, BWR/5, and BWR/6

Vendor	Fuel Design	Distinguishing Features	FA Type Code
GE	GE-2	GE-manufactured fuel for GE BWR/4-6 reactors; original core fuel for several BWR/4 plants; high failure rate instigated introduction of GE-3 and GE-4 fuels; ~195 kg U.	G4607G2
Areva (ANF)	ANF Prepres.	ANF-manufactured fuel for GE BWR/4-6 reactors; prepressurized fuel rods; ~176 kg U.	G4608AP
GE	GE-10	GE-manufactured fuel for GE BWR/4-6 reactors; fuel channel is 100 mils thick at the corners and 65 mils thick on the sides, reducing the parasitic material in core; uses flow directors on the inside of the channel thus redirecting the flow of water away from the channel wall and toward the center of the fuel bundle; estimated 177 kg U.	G4608G10
GE	GE-11	8x8 bundle with a G11 design for specific Lead Test Assemblies in Cooper Station (3001)	G4608G11
GE	GE-5	GE-manufactured fuel for GE BWR/4-6 reactors; "retrofit" fuel; 2 water rods; natural uranium axial blankets; ~183 kg U.	G4608G5
GE	GE-8	GE-manufactured fuel for GE BWR/4-6 reactors; 4 water rods; axially zoned enrichment and burnable absorbers; fuel rod prepressurization increased to 5 atmospheres; other "barrier" fuel features; ~179 kg U.	G4608G8
GE	GE-9	GE-manufactured fuel for GE BWR/4-6 reactors; ferrule-type spacer grids; large diameter water rod which displaced 4 fuel rod positions; axially zoned enrichment and burnable absorbers; fuel rod prepressurization of 5 atmospheres; “barrier” cladding; ~172 kg U.	G4608G9
GE	Barrier	GE-manufactured fuel for GE BWR/4-6 reactors; pure zirconium "barrier" on inside of cladding to reduce pellet-clad interaction; ~185 kg U.	G4608GB
GE	GE Prepres.	GE-manufactured fuel for GE BWR/4-6 reactors; fuel rods prepressurized to 3 atmospheres He; 2 water rods; ~183 kg U.	G4608GP

Vendor	Fuel Design	Distinguishing Features	FA Type Code
W	WE	WE manufactured fuel for GE BWR/4-6 reactors; "QUAD + fuel"; lead test assembly use only; a licensed version of ABB Atom water cross fuel; ~174 kg U.	G4608W
Areva (ANF)	ANF 9-2	ANF-manufactured fuel for GE BWR/4-6 reactors; 9 X 9 fuel rod array; 2 water rods; ~173 kg U.	G4609A2
Areva (ANF)	ANF 9-5	ANF-manufactured fuel for GE BWR/4-6 reactors; 5 water rods per assembly; estimated 168 kg U.	G4609A5
Areva (ANF)	ANF 9X	ANF-manufactured fuel for GE BWR/4-6 reactors; central water channel replaces 9 fuel rods; estimated 168 kg U.	G4609A9X
Areva (ANF)	ANF IX	ANF-manufactured fuel for GE BWR/4-6 reactors; central water channel replaces 9 fuel rods; regular fuel rods utilize an internal cladding liner of pure zirconium; estimated 168 kg U.	G4609AIX
Areva (ANF)	ANF IX+	ANF-manufactured fuel for GE BWR/4-6 reactors; central water channel replaces 9 fuel rods; high-performance thermal spacers; estimated 168 kg U.	G4609AX+
GE	GE11	9x9 bundle, with 74 fuel rods (66 full-length and 8 part-length rods) and 2 large water rods.	G4609G11
GE	GE13	9x9 bundle, with 74 fuel rods (66 full-length and 8 part-length rods) and 2 large water rods. Adds 8th spacer grid.	G4609G13
Areva	Atrium-10 (A/B)	8 bi-metallic ULTRAFLOW™ spacer grids, 8 part-length fuel rods, 1 water channel, 10.05 mm fuel rod diameter.	G4610A
Areva (ANF)	IX	ANF-manufactured 10x10 fuel for GE BWR/4-6 reactors; used only at Fitzpatrick (3901) in 4 Lead Test Assemblies.	G4610AIX
Areva	Atrium-10XM	Unique pellet end; Improved FUELGUARD™ filter; 9 inconel-718 ULTRAFLOW™ Type 62 spacer grids; secure quick-disconnect end fitting; 12 part-length fuel rods; 5 water channel crowns; 10.28 mm fuel rod diameter.	G4610AXM
CE		CE-manufactured SVEA fuel for BWR/4-6 reactors.	G4610C
GE	GE12	10x10 bundle, with 92 fuel rods (78 full-length and 14 part-length rods) and 2 large water rods. Adds 8th spacer grid.	G4610G12
GNF	GE14	10x10 bundle, with 92 fuel rods (78 full-length and 14 short part-length rods) and 2 large water rods. Adds 8th spacer grid. No ferrules in the top three spacers above the part-length rods.	G4610G14
GNF	GE14i	Co-60 breeding Lead Test Assemblies used only at Clinton (2301). 10x10 bundle similar to GE14.	G4610G14i
GNF	GNF2	Defender™ debris filter; advanced spacer design with reduced thickness inconel grids and flow wings; multiple sizes of part-length fuel rods; increased plenum volume and high mass fuel pellets; and simplified channels.	G4610GG2
GNF	GNF3	Evolutionary fuel based on GNF2. Features include NSF fuel channels, better fuel cycle economics, and improved resistance to debris failures (potential debris capture sites in spacers were eliminated).	G4610GG3

OMB NO. 1901-0287
Expiration Date: 08/31/2029
Burden: 90 Hours

Vendor	Fuel Design	Distinguishing Features	FA Type Code
W	SVEA-96+	10x10 fuel lattice with 96 full length fueled rods all with the same outer diameter; water cross with centralized water channel.	G4610W+
W	Optima2	10x10 fuel lattice with 96 fueled rods, including 84 regular full-length rods, 8 long part-length rods, and 4 short part-length rods; water cross with centralized water channel.	G4610WO2
Areva	Atrium-11	112 fuel rods - 92 full-length, 8 long part-length, and 12 short part-length fuel rods; Z4B fuel channels; 3rd generation FUELGUARD™ debris filters; 9 ULTRAFLOW™ spacers, axial load compression springs	G4611A

E.7 Westinghouse (W), 14x14 Fuel

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva (ANF)	ANF	ANF-manufactured fuel for W 14 x 14 reactors; for WE 14 X 14 reactors; shorter, larger diameter fuel rod than WE 14 X 14 ANF Top Rod fuel; ~377 kg U.	W1414A
Areva	HTP	Areva-manufactured fuel for W 14 x 14 reactors. Features include M5 Cladding, Advanced fuel rod geometry, HTP spacer grids, Z-4 MONOBLOC™ guide tubes; gadolinia burnable absorbers, FUELGUARD™ bottom nozzle	W1414AH
Areva (ANF)	ANF Top Rod	ANF-manufactured fuel for WE 14 x 14 reactors; longer, smaller diameter fuel rod than WE 14 X 14 ANF fuel; ~361 kg U.	W1414ATR
B&W	B&W	B&W-manufactured fuel for W 14 x 14 reactors; only 2 lead test assemblies used at Ginna; ~383 kg U.	W1414B
W	WE Standard	WE-manufactured fuel for WE 14 x 14 reactors; Zircaloy cladding, stainless steel guide tubes; ~394 kg U.	W1414W
W	WE LOPAR	WE-manufactured fuel for WE 14 x 14 reactors; “Low Parasitic (LOPAR) fuel”; Zircaloy guide tubes; often referred to as "Standard" fuel; ~399 kg U.	W1414WL
W	OFA	W-manufactured fuel for W 14 x 14 reactors; Optimized Fuel Assembly; zircaloy spacer grids; ~358 kg U/assembly	W1414WO
W	400 Vantage+	Vantage+ fuel with 0.400-inch fuel rod diameter	W1414WV1
W	422 Vantage+	Vantage+ fuel with 0.422-inch fuel rod diameter	W1414WV2

E.8 Westinghouse (W), 15x15 Fuel

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva (ANF)	ANF	ANF-manufactured fuel for WE 15 x 15 reactors; ~429 kg U.	W1515A
Areva	AGORA® 5A-1	M5 cladding; evolution of the European AFA 3G™ design.	W1515AAg
Areva	HTP	Areva-manufactured fuel for W 15 x 15 reactors. Features include M5 Cladding, Advanced fuel rod geometry, HTP spacer grids, Z-4 MONOBLOC™ guide tubes; gadolinia burnable absorbers, FUELGUARD™ bottom nozzle	W1515AH
Areva	HTP Part Length	HTP part-length assembly used for shielding purposes.	W1515AHP
Areva (ANF)	ANF Part Length	ANF manufactured fuel for WE 15 x 15 reactors; bottom 42 inches of fuel rods replaced by inserts made from stainless steel 304; assemblies placed in positions on the core periphery to provide shielding for core support structure; estimated 305 kg U.	W1515APL
W	WE Standard	WE-manufactured fuel for WE 15 x 15 reactors; Zircaloy cladding, stainless steel guide tubes; ~454 kg U.	W1515W
W	WE LOPAR	W-manufactured fuel for W 15 x 15 reactors; “Low Parasitic (LOPAR) fuel”; Zircaloy guide tubes; often referred to as "Standard" fuel; ~455 kg U.	W1515WL
W	OFA	W-manufactured fuel for W 15 x 15 reactors; Optimized Fuel Assembly; zircaloy spacer grids; ~460 kg U/assembly	W1515WO
W	Performance+	Vantage+ fuel with low cobalt top and bottom nozzles, ZrO_2 coated lower fuel rods, ZIRLO mid-grids, and mid-enrichment of the annular or solid pellets in axial blankets.	W1515WP
W	Vantage 5	W-manufactured fuel for W 15 x 15 reactors; integral ZrB_2 neutron absorbers in fuel; natural uranium axial blankets; IFMs; removable top nozzle; increased discharge burnup; other OFA features; ~461 kg U/assembly.	W1515WV5

E.9 Westinghouse (W), 17x17 Fuel

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva (ANF)	ANF	ANF manufactured fuel for WE 17 X 17 reactors; ~402 kg U.	W1717A
Areva	GAIA	Q12 guide/instrument tubes, M5 cladding, GAIA structural mixing spacer grid, GRIP bottom nozzle, HMP end grid, optional chromia fuel doping	W1717AG
Areva	HTP	Slightly heavier than Mark BW fuel; Spacer grids welded to guide tubes; Fuel Guard bottom nozzle	W1717AH
B&W/ Framatome	B&W Mark BW	B&W manufactured fuel for WE 17 X 17 reactors; ~455 kg U.	W1717B
Framatome/ Areva	Advanced Mark BW	Framatome/Areva reload fuel for W 17x17 reactors; slightly longer (0.36") fuel rods; M5 fuel rod cladding, guide thimbles, instrument tube, and spacer/mixing grids; mid-span mixing grids; and quick disconnect top nozzle connection.	W1717BAd
B&W/ Framatome	Mark BW - MOX	17x17 Mark BW Mixed Oxide (MOX) Lead Test Assemblies used at Catwaba 1.	W1717BM
W	LOPAR	W-manufactured fuel for W 17 x 17 reactors; “Low Parasitic (LOPAR) fuel”; Zircaloy guide tubes; Inconel Spacer grids; often referred to as "Standard" fuel; ~460 kg U.	W1717WL
W	NGF	W manufactured Next Generation Fuel for W 17 x 17 reactors. Optimized ZIRLO^{TM} cladding, 0.374" diameter fuel rods, axial blanket pellets, WIN top nozzle	W1717WN
W	OFA	WE-manufactured fuel for W 17 x 17 reactors; “Optimized Fuel Assemblies”; Zircaloy spacer grids; ~425 kg U.	W1717WO
W	Performance +	W manufactured 17x17 fuel using ZIRLO^{TM} cladding, low-cobalt top and bottom nozzle, enriched axial blankets, enriched ZrB_2 pellets, and ZIRLO^{TM} guide tubes, grids and IFMs.	W1717WP
W	RFA	Robust Fuel Assembly for use at W 17x17 plants. RFA fuel is based on Vantage+ fuel, and features include Optimized ZIRLO^{TM} cladding; 0.374" diameter fuel rods; increased guide and instrument tube diameters, low pressure drop mid grips, modified IFMs, a protective bottom grid with long fuel rod end plugs, and a quick release top nozzle.	W1717WR
W	RFA-2	Robust Fuel Assembly 2 for use at W 17x17 plants. Features include Optimized ZIRLO^{TM} cladding, heat transfer improvements, ZrB_2 integral burnable absorbers, enhanced debris mitigation, and reduced enrichment axial blankets.	W1717WR2
W	Vantage+	W-manufactured fuel for W 17 x 17 reactors, Vantage 5 features with ZIRLO^{TM} cladding	W1717WV+
W	Vantage 5	W-manufactured fuel for W 17 x 17 reactors; integral ZrB_2 neutron absorbers in fuel; natural uranium axial blankets; IFMs;	W1717WV5

Vendor	Fuel Design	Distinguishing Features	FA Type Code
		removable top nozzle; increased discharge burnup; other OFA features; ~426 kg U/assembly	
W	Vantage 5H	W-manufactured fuel for W 17 x 17 reactors; hybrid fuel combining the advanced neutronic features of Vantage 5 fuel with the larger fuel rod diameter associated with LOPAR fuel.	W1717WVH
W	Vantage 5H+		W1717WVJ

E.10 Reactor Specific Fuel Codes

Big Rock Point			
Vendor	**Fuel Design**	**Distinguishing Features**	**FA Type Code**
GE, GNF		GE manufactured fuel for use at Big Rock Point developmental center melt fuel; test assembly use only; ~131 kg U.	XBR07G
GE, GNF		GE manufactured fuel for use at Big Rock Point developmental center melt fuel; test assembly use only; ~112 kg U.	XBR08G
GE, GNF		GE manufactured fuel for use at Big Rock Point; Zircaloy cladding; generic designation which encompasses "E," "EG," "F," "MEG," and "PEG" assembly types; ~137 kg U.	XBR09A
GE, GNF		GE manufactured fuel for use at Big Rock Point; Zircaloy cladding; generic designation which encompasses "E," "EG," "F," "MEG," and "PEG" assembly types; ~137 kg U.	XBR09G
ANF		ANF manufactured fuel for use at Big Rock Point; ~128 kg U.	XBR11A
GE, GNF		GE manufactured fuel for use at Big Rock Point; Zircaloy cladding; generic designation which encompasses "B," "C," "D1," and "D2" assembly types; most assemblies reprocessed at West Valley; ~124 kg U.	XBR11G
NFS		NFS manufactured fuel for use at Big Rock Point; lead test assembly use only; ~129 kg U.	XBR11N

Dresden			
Vendor	**Fuel Design**	**Distinguishing Features**	**FA Type Code**
Areva (ANF)	ANF	ANF-manufactured fuel for use at Dresden 1; ~95 kg U.	XDR06A
GE, GNF	Type 1	GE-manufactured fuel for use at Dresden 1; all but one assembly reprocessed at West Valley; ~111 kg U.	XDR06G
GE, GNF	GE Type III-B	GE-manufactured fuel for use at Dresden 1; erbium oxide as burnable absorber in all 36 fuel rods; some assemblies reprocessed at West Valley; ~102 kg U.	XDR06G3B
GE, GNF	GE Type III-F	GE-manufactured fuel for use at Dresden 1; gadolinium oxide as a burnable absorber in a single, nonfueled rod; some assemblies reprocessed at West Valley; ~102 kg U.	XDR06G3F
GE, GNF	GE Type V	GE-manufactured fuel for use at Dresden 1; gadolinium oxide as a burnable absorber in selected fuel rods; ~106 kg U.	XDR06G5
UNC, U	UNC	UNC-manufactured fuel for use at Dresden 1; ~102 kg U.	XDR06U
GE, GNF	GE SA-1	GE-manufactured fuel for use at Dresden 1; a single prototype fuel assembly manufactured and owned by GE.	XDR07GS
GE, GNF	GE PF Fuels	GE-manufactured fuel for use at Dresden 1; prototype fuel assemblies with 6 X 6, 7 X 7, and 8 X 8 fuel rod arrays; all have been reprocessed except for one 8 X 8 assembly; ~100 kg U.	XDR08G

Fort Calhoun			
Vendor	**Fuel Design**	**Distinguishing Features**	**FA Type Code**
ANF	ANF	ANF-manufactured fuel for Fort Calhoun reactor.	XFC14A
Areva/ Framatome	Areva/Framatome	Areva-manufactured fuel for Fort Calhoun reactor. Fuel rods use M5 cladding.	XFC14AF
CE		CE-manufactured fuel for Fort Calhoun reactor.	XFC14C
W		W manufactured fuel for Fort Calhoun reactor.	XFC14W

Haddam Neck			
Vendor	**Fuel Design**	**Distinguishing Features**	**FA Type Code**
B&W	B&W SS	B&W manufactured fuel for use at Haddam Neck; stainless steel clad; ~412 kg U.	XHN15B
B&W	B&W Zr	B&W manufactured fuel for use at Haddam Neck; Zircaloy clad; ~364 kg U.	XHN15BZ
GULF, GA	GULF SS	GULF manufactured fuel for use at Haddam Neck; stainless steel clad; lead test assembly use only; ~406 kg U.	XHN15HS
GULF, GA	GULF Zr	GULF manufactured fuel for use at Haddam Neck; Zircaloy clad; lead test assembly use only; ~363 kg U.	XHN15HZ
	NUMEC SS	NU manufactured fuel for use at Haddam Neck; stainless steel clad; lead test assembly use only; ~406 kg U.	XHN15MS
	NUMEC Zr	NU manufactured fuel for use at Haddam Neck; Zircaloy clad; lead test assembly use only; ~371 kg U.	XHN15MZ
W	WE	WE manufactured fuel for use at Haddam Neck; stainless steel clad; ~416 kg U.	XHN15W
W	WE	WE manufactured fuel for use at Haddam Neck; Zircaloy clad.	XHN15WZ

Humboldt Bay			
Vendor	**Fuel Design**	**Distinguishing Features**	**FA Type Code**
ANF	ANF	ANF manufactured fuel for use at Humboldt Bay; Zircaloy cladding; ~76 kg U.	XHB06A
GE, GNF	GE	GE manufactured fuel for use at Humboldt Bay; Zircaloy cladding; ~76 kg U.	XHB06G
GE, GNF	GE Type II	GE manufactured fuel for use at Humboldt Bay; Zircaloy cladding; some assemblies reprocessed at West Valley; ~76 kg U.	XHB07G2

Indian Point			
Vendor	**Fuel Design**	**Distinguishing Features**	**FA Type Code**
W	WE	WE manufactured fuel for use at Indian Point 1; stainless steel clad; dimensions are as specified above for Indian Point 1 assembly class; some assemblies reprocessed at West Valley; ~191 kg U.	XIP14W

LaCrosse			
Vendor	**Fuel Design**	**Distinguishing Features**	**FA Type Code**
ANF	ANF	ANF manufactured fuel for use at LaCrosse; stainless steel cladding; ~109 kg U.	XLC10A
AC	AC	AC manufactured fuel for use at LaCrosse; stainless steel cladding; ~120 kg U.	XLC10L

Palisades			
Vendor	**Fuel Design**	**Distinguishing Features**	**FA Type Code**
ANF		ANF-manufactured fuel for Palisades reactor.	XPA15A
Areva/ Framatome	HTP	Areva-manufactured fuel for Palisades reactor. Features include M5 Cladding, Advanced fuel rod geometry, HTP spacer grids, Z-4 MONOBLOC™ guide tubes; gadolinia burnable absorbers, FUELGUARD™ bottom nozzle.	XPA15AH
CE		CE-manufactured fuel for Palisades reactor.	XPA15C

San Onofre 1			
Vendor	**Fuel Design**	**Distinguishing Features**	**FA Type Code**
W	WE	WE manufactured fuel for use at San Onofre 1; stainless steel clad; ~366 kg U.	XSO14W
W	WE Zr	WE manufactured fuel for use at San Onofre 1; Zircaloy clad demonstration fuel; no weight available.	XSO14WZ

St. Lucie 2			
Vendor	**Fuel Design**	**Distinguishing Features**	**FA Type Code**
Areva	HTP	Areva-manufactured HTP fuel for St. Lucie 2 reactor. Features include M5 Cladding, Advanced fuel rod geometry, HTP spacer grids, Z-4 MONOBLOC™ guide tubes; gadolinia burnable absorbers, FUELGUARD™ bottom nozzle.	XSL16AH
CE		CE-manufactured fuel for St. Lucie 2 reactor.	XSL16C
W		W manufactured fuel for St. Lucie 2 reactor.	XSL16W

South Texas			
Vendor	**Fuel Design**	**Distinguishing Features**	**FA Type Code**
W	XL	Original W manufactured fuel for use at South Texas.	WST17W
W	XL RFA	W manufactured fuel for use at South Texas. Robust Fuel Assemblies, with no IFMs; ZIRLO™ cladding; reduced enrichment axial blankets, IFBA rods and gadolinia rods.	WST17WR

W	XL RFA-2	W manufactured fuel for use at South Texas. Robust Fuel Assembly 2 for use at South Texas. Features include Optimized ZIRLO^{TM} cladding, heat transfer improvements, ZrB_2 integral burnable absorbers, enhanced debris mitigation, and reduced enrichment axial blankets.	WST17WR2

Yankee Rowe			
Vendor	**Fuel Design**	**Distinguishing Features**	**FA Type Code**
ANF	ANF	ANF manufactured fuel for use at Yankee Rowe; nonsquare array designed to allow space for cruciform control blades; ~234 kg U.	XYR16A
CE	CE	CE manufactured fuel for use at Yankee Rowe; nonsquare array designed to allow space for cruciform control blades; ~229 kg U.	XYR16C
UNC, U	UNC	UNC manufactured fuel for use at Yankee Rowe; nonsquare array designed to allow space for cruciform control blades; ~239 kg U.	XYR16U
W	WE	WE manufactured fuel for use at Yankee Rowe; stainless steel clad; nonsquare array designed to allow space for cruciform control blades; most assemblies reprocessed at West Valley; ~273 kg U.	XYR18W