OMB NO. xxxx-xxxx
Expiration Date: xx/xx/xxxx
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, to the Energy Information Administration, Office of Survey Development and Statistical Integration, EI-21, 1000 Independence Avenue, S.W., Washington, DC 20585, and to the Office of Information and Regulatory Affairs, Office of Management and Budget, 735 17th Street, N.W., Washington, DC 20503. Alternatively, comments can be made through the website or emailed to gc859help@pnnl.gov.

Form Due Date: This form shall be submitted by September 30, 2023. Unless otherwise indicated, data on the form should reflect the spent fuel discharged from January 1, 2018 - December 31, 2022.

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) 375-3976, 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 K9-89
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, 2018
End Report Period: December 31, 2022

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 ☐

GC-859

NUCLEAR FUEL DATA SURVEY

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 and Spent Fuel Storage Site Identification Codes."

Reactor Identifier	Reactor Name

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

See Appendix C, "Reactor and Spent Fuel Storage Site Identification Codes."

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: ____

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: ____

Title: ____

Signature: ____

Date: ____

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

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: ____________________

Title: ____________________

Mailing Address: ____________________

____

____

City: ____________________ State: ________ Zip Code: ______________

Telephone Number: ____________________

Email: ____________________

B.2 Reactor License Data

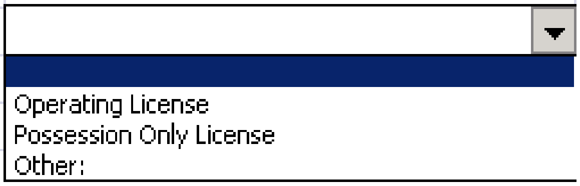
Complete a Schedule B.2 for each reactor, including operating and shutdown reactors.

B.2.1 Reactor Identifier

__________ (See Appendix C, "Reactor and Spent Fuel Storage Site Identification Codes.")

B.2.2 NRC License Expiration Date (MM/DD/YYYY): ___/ ___ /_______

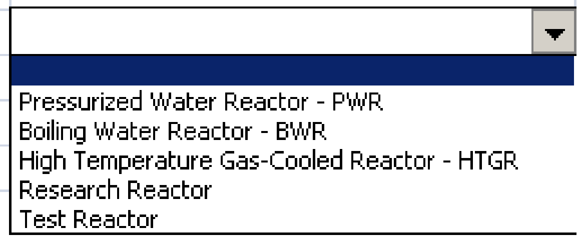
B.2.3 NRC License Type:



Operating License
Possession Only License
Other:

Provide the expiration date of the reactor's NRC operating license as of the end of the reporting period for this data submission. If the reactor is permanently shutdown, provide the expiration date of the NRC possession only license.

B.2.4 Reactor Type:



Pressurized Water Reactor - PWR
Boiling Water Reactor - BWR
High Temperature Gas-Cooled Reactor - HTGR
Research Reactor
Test Reactor

GC-859

NUCLEAR FUEL DATA SURVEY

COMMENTS

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

Schedule and Item Number	Comment

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)**

GC-859

NUCLEAR FUEL DATA SURVEY

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

GC-859

NUCLEAR FUEL DATA SURVEY

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 IIdentifier**	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	**IInitial Heavy Metal Content**	The initial heavy metal content (uranium) of the fuel assembly in kilograms (reported to the nearest thousandth of a kilogram).
3	**IInitial Enrichment**	The initial enrichment of the assembly (reported to the nearest hundredth of a percent). Report the maximum Planar-Average Initial Enrichment.
4	**Mixed Oxide Fuel Data**	Check box and report MOX data (plutonium) in comments, if necessary.
5	**Discharge Burnup**	The assembly burnup at discharge (reported in megawatt days thermal per metric ton of (initially loaded) uranium (MWD_t/MTU)).
6	**Last Cycle Number**	The cycle number (including subcycles) for the assembly’s final cycle of irradiation.
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.

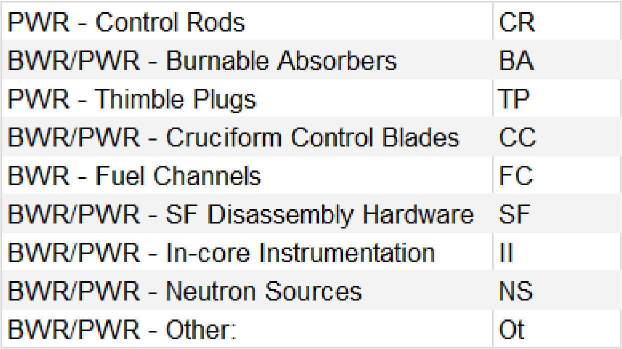
Status Identifier	Description
8A	Non-standard assembly.[1, 2]
8B	Failed fuel.[3]
8C	Containerized assembly; the assembly has been placed in a single-element container. Do not report assemblies that have been placed into a multi-element canister as containerized.
8D	Fuel rods have been removed from the 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.

9	**Storage Location**	The pool or dry storage site identifier (from Appendix C, “Reactor and Spent Fuel Storage Site Identification Codes”) corresponding to the current storage location of the assembly.

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 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. For example, changes to an assembly’s maximum physical dimensions due to the NFC may cause it to be classified as non-standard. The non-fuel component integral to an assembly specific data to be reported in C.1.1 are as follows:

Column	Data Element	Description
10	**Non-fuel Component**[1]	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

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

[1] Standard assembly, non-standard assembly, and non-fuel component as defined in the Standard Contract Appendix E.

[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.

GC-859

NUCLEAR FUEL DATA SURVEY

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	10	11	12
Assembly Identifier		**Initial Heavy Metal Content**	**Initial Enrichment (Weight %)**	**Mixed Oxide Fuel Data**[1]	**Discharge Burnup (MWD$_t$/MTU)**	**Last Cycle Number**	**Fuel Assembly Type Code**[2]	**Assembly Status Indicators**							**Storage Location**	**NFC**[3]	**NFC Identifier**	**Estimated Total Weight (lbs)** [4]
								Non-Standard	**Failed**	**Containerized**	**Fuel Rod(s) Removed**	**Replacement Rods (Fueled)**	**Replacement Rods (Non-fueled)**	**Other**				
Primary	**Secondary**	**kgU**	**U-235**					**8A**	**8B**	**8C**	**8D**	**8E**	**8F**	**8G**				
				☐				☐	☐	☐	☐	☐	☐	☐				
				☐				☐	☐	☐	☐	☐	☐	☐				
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				☐				☐	☐	☐	☐	☐	☐	☐				
				☐				☐	☐	☐	☐	☐	☐	☐				

[1] For MOX fuel, please include a comment stating the initial heavy metal content (kgPu) and weight percentage of the plutonium (^{239}Pu and ^{241}Pu).

[2] Fuel Assembly Type data selected from Appendix E (drop-down menu) or entered by cycle and fuel batch using Schedule C.1.3.

[3] 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 drop-down menu.

[4] Estimated total weight of the non-fuel component(s) plus assembly

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GC-859

NUCLEAR FUEL DATA SURVEY

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 Cycle Numbers						Cumulative Burnup for Each Cycle (MWD$_t$/MTU)					

GC-859

NUCLEAR FUEL DATA SURVEY

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, use the ‘Other’ code provided for each reactor design and provide assembly details in the comments.

4. The following reactors have their own unique codes: South Texas Units 1 and 2, Ft. Calhoun, Palisades, and St. Lucie Unit 2. See Appendix E.10

Fuel Assembly Type data for all assemblies discharged from January 1, 2003 – December 31, 2017 was collected in the 2018 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, 2018 - December 31, 2022 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, 2017. Use the storage site identifiers from Appendix C, “Reactor and Spent Fuel Storage Site Identification Codes.”

Assembly Identifier	Original Storage Site Identifier	Current Storage Site Identifier

GC-859

NUCLEAR FUEL DATA SURVEY

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

DOE paused collection of this data starting with the survey covering the July 1, 2013 – December 31, 2017 period.

C.3 Special Fuel Forms

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

— Single Assembly Canisters (Complete Schedule C.3.1)

— Uncanistered 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 – Canisters

A canister is defined as any single assembly canister designed to confine contents that may be delivered to a DOE facility. Within this schedule, canistered material may include damaged assemblies, reconstituted assemblies, fuel rods that have been removed from an assembly, and miscellaneous fuel. Empty canisters should not be reported.

Does your facility have single assembly canisters?

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

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

For all single assembly canisters, provide a detailed description.

C.3.1.1 Single Assembly Canisters Description

Canister Identifier	Canister Shape		Canister 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

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[1] See Appendix C, "Reactor and Spent Fuel Storage Site Identification Codes."

C.3.1.2 Qualitative Single Assembly Canister Contents

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

Canister Identifier	Description of Contents (check all that apply) [1]	Canister Closure			Is Canister 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

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

C.3.1.3 Detailed Single Assembly Canister Contents

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

Canister Identifier	Source Assembly Identifier[1]	Number of Fuel Rod Equivalents from Assembly	Initial Heavy Metal Content[2]	Discharge Burnup[3] (MWD_t/MTU)
			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.

[3] Discharge Burnup of Source Assembly Identifier.

GC-859

NUCLEAR FUEL DATA SURVEY

COMMENTS

Provide any comments you have concerning Special Fuel Form – Canisters (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 – Uncanistered Fuel Rods/Pieces

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

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

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

For all uncanistered fuel rods and fuel pieces, provide a detailed description.

Source Assembly Identifier[1]	**Number of Uncanistered Fuel Rods or Pieces from Assembly**	**Initial Heavy Metal Content[2]**	**Discharge Burnup[3] (MWD$_t$/MTU)**
		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.

[3] Discharge Burnup of Source Assembly Identifier.

GC-859

NUCLEAR FUEL DATA SURVEY

COMMENTS

Provide any comments you have concerning Special Fuel Form – Uncanistered 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; & Failed Fuel

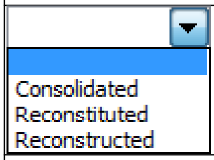
C.3.3.1 Special Fuel Form – Consolidated/Reconstituted/Reconstructed Assemblies

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]	Description of Assembly
				Initial kgU	
					

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[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, Natural U-235, Enriched U-235, Inert 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.

GC-859

NUCLEAR FUEL DATA SURVEY

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**

For each assembly that is non-standard due to either exceeding the maximum nominal physical dimensions specification set forth in Appendix E of the Standard Contract (also provided below) or being other than 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.

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. ☐

GC-859

NUCLEAR FUEL DATA SURVEY

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 canistered or uncanistered 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 pulldown menu: F-1: Visual Failure or Damage; F-2: Radioactive "Leakage"; F-3: Encapsulated

GC-859

NUCLEAR FUEL DATA SURVEY

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.

GC-859

NUCLEAR FUEL DATA SURVEY

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

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: ______________________________

Title: ______________________________

Mailing Address: ______________________________

____

____

City: ____________________ State: ________ Zip Code: ________

Telephone Number: ______________________________

Email: ______________________________

GC-859

NUCLEAR FUEL DATA SURVEY

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

_________ (See Appendix C, "Reactor and Spent Fuel Storage Site Identification Codes.")

D.2.2 Storage Capacity

	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	**Number of Assemblies**
Total Storage Site Inventory	

GC-859

NUCLEAR FUEL DATA SURVEY

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 and Spent Fuel Storage Site Identification Codes.”)

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.

Unique Canister/Cask Identifier	Vendor	Model Number	Date Loaded (MM/YYYY)	Number of Assemblies Stored	Map Reference	Map Filename
Total Number of Assemblies in Dry Storage						

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.

GC-859

NUCLEAR FUEL DATA SURVEY

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.

Unique Canister/Cask Identifier	Assembly Identifier[1]	Position According to Map
______		
______		
______		
______		
______		

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

GC-859

NUCLEAR FUEL DATA SURVEY

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

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), canistered (enter data in Schedule E.3), or separate from an assembly and uncanistered 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

This data is reported in C.1.1 columns 10, 11, and 12. E.2 is no longer used and is kept as a place holder for consistency with prior surveys. If reporting this data in C.1.1 instead of E.2 is a large burden to the respondent, please contact PNNL. For non-fuel components (NFCs) which have been moved during the current reporting period to or from an assembly identified as being discharged in a previous reporting period, NFC-related information for the affected assembly or assemblies can be updated in Schedule C.1.1. Please contact PNNL for any assistance.

E.3 Non-fuel Components – Canistered

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

Are there canisters or containers of non-fuel components in your pool planned for delivery to a DOE facility?

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

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

Canister Identifier	Canister Shape		Canister Dimensions (to nearest 0.1 inch)			Loaded Weight (lbs)[1]	Type of Non-fuel Component[2]	Number of Individual Items	Canister Closure			Is Canister 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 Canister including the non-fuel components.

[2] For each canister 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 canister.

[3] Indicate whether the canister 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 and Spent Fuel Storage Site Identification Codes”.

GC-859

NUCLEAR FUEL DATA SURVEY

COMMENTS

Provide any comments you have concerning Non-Fuel Data (Non-fuel Components – Canistered) (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 Uncanistered

Does your facility have uncanistered non-fuel components that are separate from an assembly and currently stored in a storage pool that are planned for delivery to a DOE facility?

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

______ No. Skip to **Schedule F**

List and estimate the number of each applicable type of uncanistered non-fuel component separate from an assembly and indicate the storage pool location from Appendix C “Reactor and Spent Fuel Storage Site Identification Codes”.

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:		

GC-859

NUCLEAR FUEL DATA SURVEY

COMMENTS

Provide any comments you have concerning Non-Fuel Data (Non-fuel Components – Separate from an Assembly and Uncanistered) (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

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: ____________________

Title: ____________________

Mailing Address: ____________________

____

____

City: ____________________ State: ________ Zip Code: __________

Telephone Number: ____________________

Email: ____________________

GC-859

NUCLEAR FUEL DATA SURVEY

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

NUCLEAR FUEL DATA SURVEY

F.2 Stored Inventory

Include in this section GTCC waste that is currently packaged and available for disposal as of December 31, 2022.

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.

Pack aged Volume (ft^3)[1]	Pack age Contents[2]	Pack aging[3]		Package Dimensions				Loaded Weight of Pack age (lbs)	Date Pack aged	Total Pack age 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 (ft^3)					Yes	No		
											1	☐	☐		
												☐	☐		
												☐	☐		
												☐	☐		
												☐	☐		
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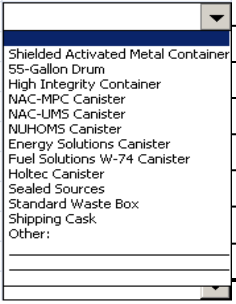
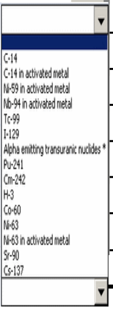


Shielded Activated Metal Container
55-Gallon Drum
High Integrity Container
NAC-MPC Canister
NAC-UMS Canister
NUHOMS Canister
Energy Solutions Canister
Fuel Solutions W-74 Canister
Holtec Canister
Sealed Sources
Standard Waste Box
Shipping Cask
Other:



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}):** Combined volume of the waste and the storage container.
[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

GC-859

NUCLEAR FUEL DATA SURVEY

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

GC-859

NUCLEAR FUEL DATA SURVEY

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 ▼	☐	☐		
												☐	☐		
												☐	☐		
												☐	☐		
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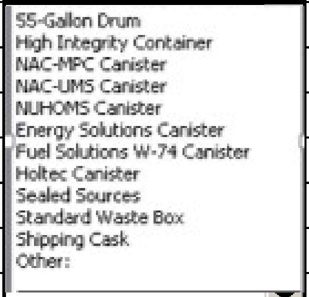
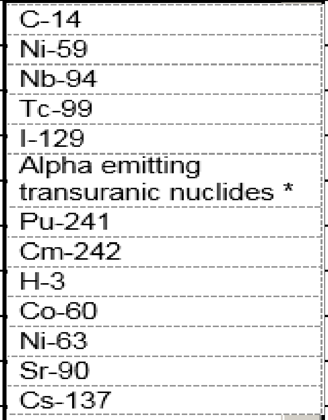


55-Gallon Drum
High Integrity Container
NAC-MPC Canister
NAC-UMS Canister
NUHOMS Canister
Energy Solutions Canister
Fuel Solutions W-74 Canister
Holtec Canister
Sealed Sources
Standard Waste Box
Shipping Cask
Other:



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

---

[1] **Packaged Volume (ft ^{3}):** Combined volume of the waste and the storage container.
[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

GC-859

NUCLEAR FUEL DATA SURVEY

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 (2023-2070)

F.3.1 Activated Metals

Include GTCC waste not packaged and waste projected to be generated from licensed activities from 2023 through reactor decommissioning. Include all waste not in F.2.1.

Years Packaged	Description of Waste[1]	Estimated Unpackaged Volume[2] (ft^3)	Estimated Packaged Volume[3] [If known] (ft^3)
2023-2030			
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.

GC-859

NUCLEAR FUEL DATA SURVEY

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 2023 through reactor decommissioning. Include all waste not in F.2.2.

Years Packaged	Description of Waste[1]	Estimated Unpackaged Volume[2] (ft^3)	Estimated Packaged Volume[3] [If known] (ft^3)	RCRA Listed Hazardous Waste Constituents or Characteristics[4]
2023-2030				
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.

GC-859

NUCLEAR FUEL DATA SURVEY

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

GC-859

NUCLEAR FUEL DATA SURVEY

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 **September 30, 2023** following receipt of the form. Unless otherwise indicated, data on the form should reflect the spent fuel discharged from **January 1, 2018 - December 31, 2022**.

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*. Alternatively, you may request a copy of the submission software from the PNNL GC-859 Survey Team contact.

Also include a signed copy (i.e., scanned to PDF file) of **Schedule A** along with your submittal. 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 and Sanctions Statement

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

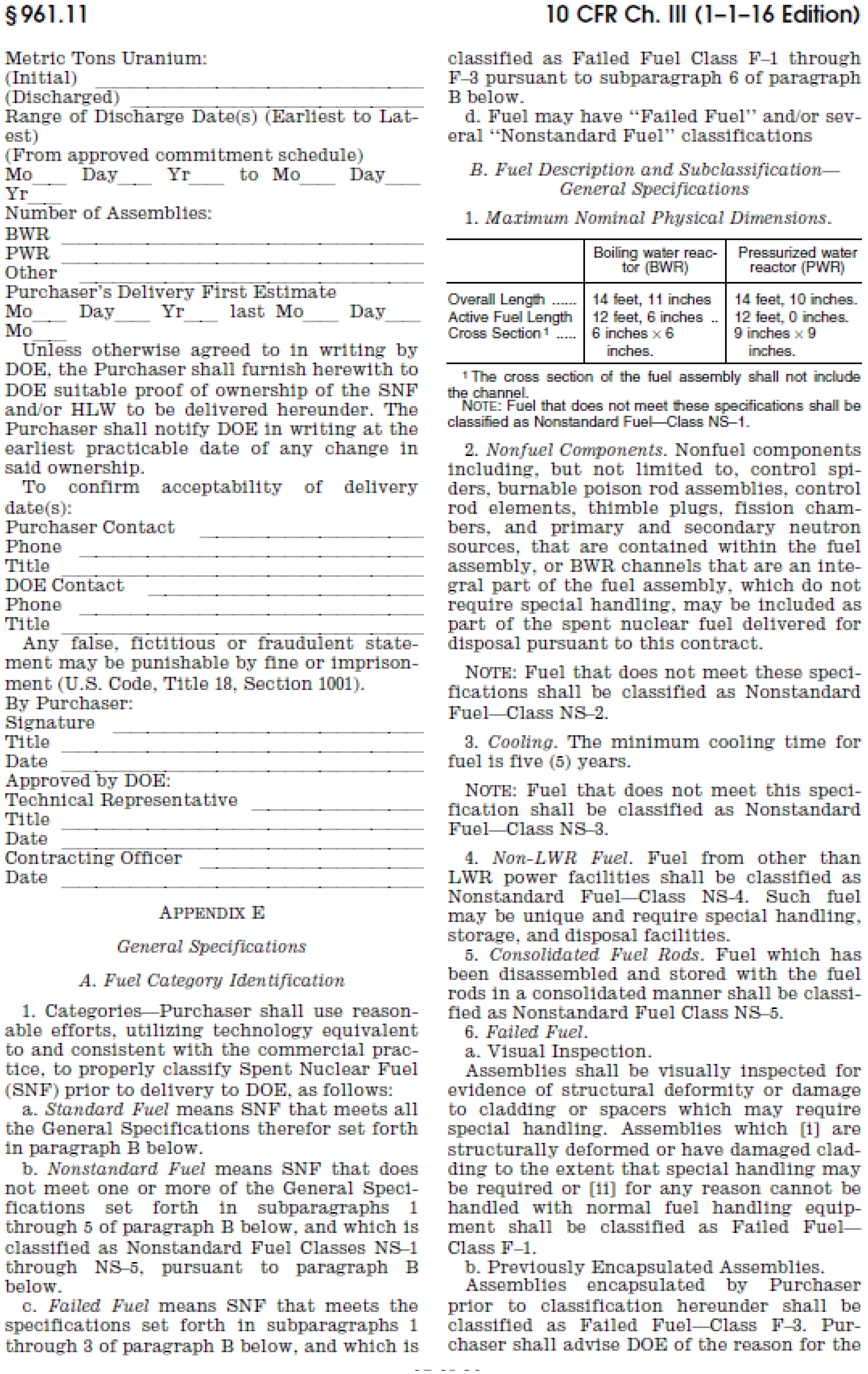
Instructions for filing the individual Schedules of the Form GC-859 survey are included within the schedules.

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

GC-859

NUCLEAR FUEL DATA SURVEY

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.

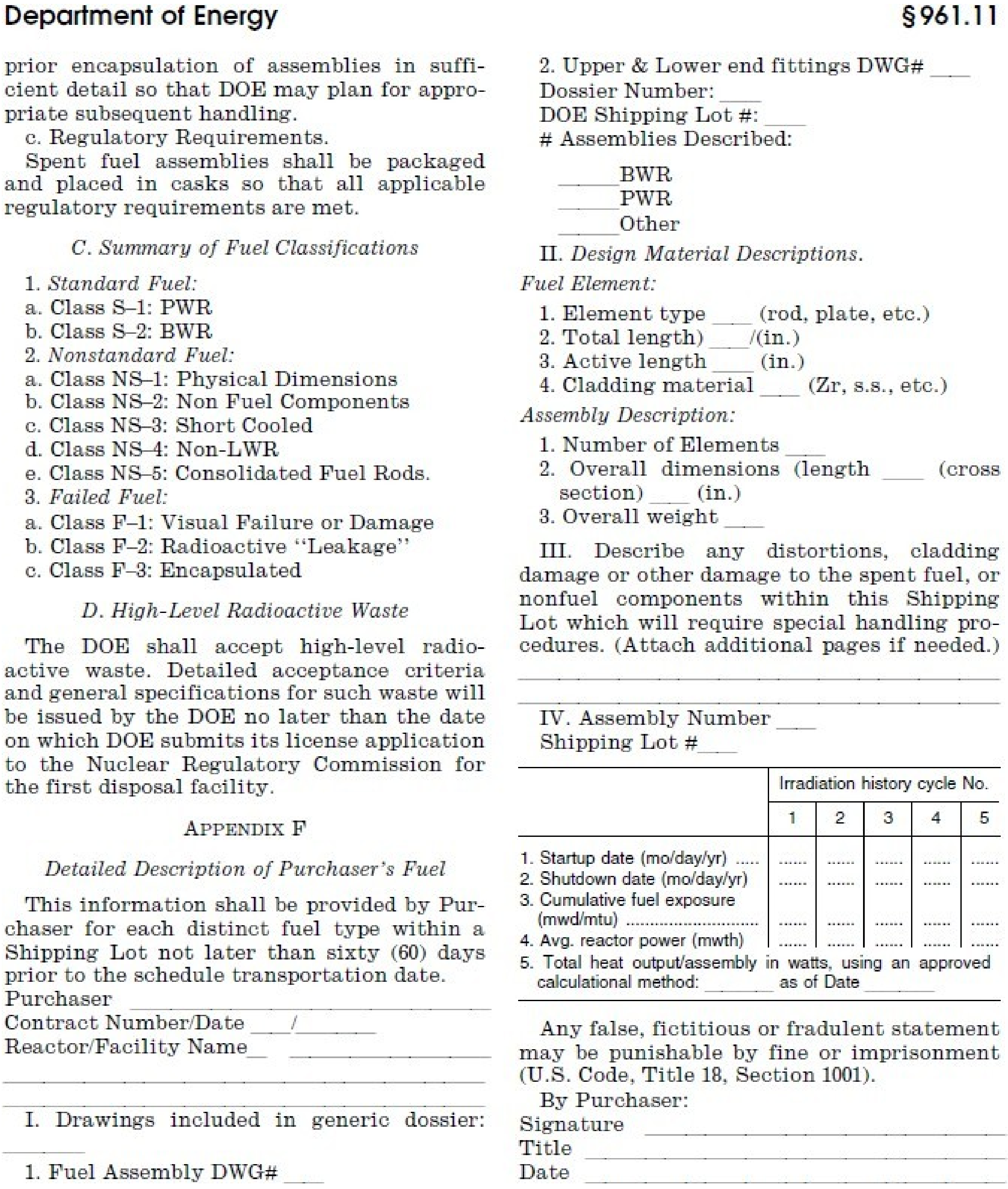
Assemblies shall be visually inspected for evidence of structural deformity or damage to cladding or spacers which may require special handling. Assemblies which [i] are structurally deformed or have damaged cladding to the extent that special handling may be required or [ii] for any reason cannot be 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

GC-859

NUCLEAR FUEL DATA SURVEY



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 ____________________

APPENDIX C – REACTOR AND SPENT FUEL STORAGE SITE IDENTIFICATION CODES

Storage Location	Reactor ID	Storage Site ID	Note
Aerotest	8001	8001	
Arkansas Nuclear One - Unit 1	0401	0401	
Arkansas Nuclear One - Unit 2	0402	0402	
Arkansas Nuclear One (ISFSI)	-	0401D	DC
Beaver Valley - Unit 1	1601	1601	
Beaver Valley - Unit 2	1602	1602	
Beaver Valley (ISFSI)	-	1601D	DC
Big Rock Point	1201	1201	
Big Rock Point (ISFSI)	-	1201D	DC
Braidwood - Unit 1	1001	1001	CP
Braidwood - Unit 2	1002	1001	CP
Braidwood (ISFSI)	-	1001D	DC
Browns Ferry - Unit 1	4803	4803	TC
Browns Ferry - Unit 2	4804	4803	TC
Browns Ferry - Unit 3	4805	4805	
Browns Ferry (ISFSI)	-	4803D	DC
Brunswick - Unit 1	0701	0701	
Brunswick - Unit 2	0702	0702	
Brunswick (ISFSI)	-	0701D	DC
BWXT Services (Lynchburg)	7101	7101	
Byron - Unit 1	1003	1003	CP
Byron - Unit 2	1004	1003	CP
Byron (ISFSI)	-	1003D	DC
Callaway	5101	5101	
Callaway (ISFSI)	-	5101D	DC
Calvert Cliffs - Unit 1	0501	0501	TC
Calvert Cliffs - Unit 2	0502	0501	TC
Calvert Cliffs (ISFSI)	-	0501D	DC
Catawba - Unit 1	1501	1501	
Catawba - Unit 2	1502	1502	
Catawba (ISFSI)	-	1501D	DC
Clinton	2301	2301	
Clinton (ISFSI)	-	2301D	DC
Columbia	5302	5302	
Columbia (ISFSI)	-	5302D	DC
Comanche Peak - Unit 1	4901	4901	TC
Comanche Peak - Unit 2	4902	4901	TC
Comanche Peak (ISFSI)	-	4901D	DC
Cook - Unit 1	5801	5801	CP
Cook - Unit 2	5802	5801	CP
Cook (ISFSI)	-	5801D	DC
Cooper Station	3001	3001	
Cooper Station (ISFSI)	-	3001D	DC
Crystal River 3	1701	1701	
Crystal River 3 (ISFSI)	-	1701D	DC
Davis-Besse	5001	5001	
Davis-Besse (ISFSI)	-	5001D	DC
Diablo Canyon - Unit 1	3501	3501	
Diablo Canyon - Unit 2	3502	3502	
Diablo Canyon (ISFSI)	-	3501D	DC
Dow	8103	8103	
Dresden - Unit 1	1005	1005	
Dresden - Unit 2	1006	1006	
Dresden - Unit 3	1007	1007	
Dresden (ISFSI)	-	1005D	DC
Duane Arnold	2401	2401	
Duane Arnold (ISFSI)	-	2401D	DC
Enrico Fermi 2	1402	1402	
Enrico Fermi 2 (ISFSI)	-	1402D	DC
Farley - Unit 1	0101	0101	
Farley - Unit 2	0102	0102	
Farley (ISFSI)	-	0101D	DC
Fitzpatrick	3901	3901	
Fitzpatrick (ISFSI)	-	3901D	DC
Fort Calhoun	3401	3401	
Fort Calhoun (ISFSI)	-	3401D	DC
Fort St. Vrain	4101	4101	
Fort St. Vrain (ISFSI)	-	4101D	DC
General Atomics	8102	8102	
GE-Hitachi (Morris)	-	6601	
GE-Hitachi (Vallecitos)	-	6201	
Ginna	4401	4401	
Ginna (ISFSI)	-	4401D	DC
Grand Gulf	2901	2901	
Grand Gulf (ISFSI)	-	2901D	DC
H. B. Robinson	0705	0705	
H. B. Robinson (ISFSI)	-	0705D	DC
Haddam Neck	5701	5701	
Haddam Neck (ISFSI)	-	5701D	DC
Harris	0703	0703	
Harris (ISFSI)	-	0703D	DC
Hatch - Unit 1	2001	2001	TC
Hatch - Unit 2	2002	2001	TC
Hatch (ISFSI)	-	2001D	DC
Hope Creek	4201	4201	
Hope Creek/Salem (ISFSI)	-	4201D	DC
Humboldt Bay	3503	3503	
Humboldt Bay (ISFSI)	-	3503D	DC
Idaho National Laboratory	-	7002	
Indian Point - Unit 1	1101	1101	
Indian Point - Unit 2	1102	1102	TC
Indian Point - Unit 3	3902	1102	TC
Indian Point (ISFSI)	-	1101D	DC
Kewaunee	5501	5501	
Kewaunee (ISFSI)	-	5501D	DC
Lacrosse	1301	1301	
Lacrosse (ISFSI)	-	1301D	DC
LaSalle County - Unit 1	1008	1008	TC
LaSalle County - Unit 2	1009	1008	TC
LaSalle County (ISFSI)	-	1008D	DC
Limerick - Unit 1	3701	3701	TC
Limerick - Unit 2	3702	3701	TC
Limerick (ISFSI)	-	3701D	DC
Maine Yankee	2801	2801	
Maine Yankee (ISFSI)	-	2801D	DC
McGuire - Unit 1	1504	1504	
McGuire - Unit 2	1505	1505	
McGuire (ISFSI)	-	1504D	DC
Millstone - Unit 1	3201	3201	
Millstone - Unit 2	3202	3202	
Millstone - Unit 3	3203	3203	
Millstone (ISFSI)	-	3201D	DC
Monticello	3301	3301	
Monticello (ISFSI)	-	3301D	DC
Nine Mile Point - Unit 1	3101	3101	
Nine Mile Point - Unit 2	3102	3102	
Nine Mile Point (ISFSI)	-	3101D	DC
North Anna - Unit 1	5201	5201	CP
North Anna - Unit 2	5202	5201	CP
North Anna (ISFSI)	-	5201D	DC

Storage Location	Reactor ID	Storage Site ID	Note
Oconee - Unit 1	1506	1506	CP
Oconee - Unit 2	1507	1506	CP
Oconee - Unit 3	1508	1508	
Oconee (ISFSI)	-	1506D	DC
Oyster Creek	1903	1903	
Oyster Creek (ISFSI)	-	1903D	DC
Pacific Northwest National Laboratory	-	8401	
Palisades	1204	1204	
Palisades (ISFSI)	-	1204D	DC
Palo Verde - Unit 1	0301	0301	
Palo Verde - Unit 2	0302	0302	
Palo Verde - Unit 3	0303	0303	
Palo Verde (ISFSI)	-	0301D	DC
Peach Bottom - Unit 2	3704	3704	
Peach Bottom - Unit 3	3705	3705	
Peach Bottom (ISFSI)	-	3704D	DC
Perry - Unit 1	0901	0901	
Perry (ISFSI)	-	0901D	DC
Pilgrim - Unit 1	0601	0601	
Pilgrim (ISFSI)	-	0601D	DC
Point Beach - Unit 1	5401	5401	CP
Point Beach - Unit 2	5402	5401	CP
Point Beach (ISFSI)	-	5401D	DC
Prairie Island - Unit 1	3302	3302	CP
Prairie Island - Unit 2	3303	3302	CP
Prairie Island (ISFSI)	-	3302D	DC
Quad Cities - Unit 1	1010	1010	TC
Quad Cities - Unit 2	1011	1010	TC
Quad Cities (ISFSI)	-	1010D	DC
Rancho Seco	4501	4501	
Rancho Seco (ISFSI)	-	4501D	DC
River Bend	2101	2101	
River Bend (ISFSI)	-	2101D	DC
Salem - Unit 1	4202	4202	
Salem - Unit 2	4203	4203	
Salem/Hope Creek (ISFSI)	-	4201D	DC
San Onofre - Unit 1	4701	4701	
San Onofre - Unit 2	4702	4702	
San Onofre - Unit 3	4703	4703	
San Onofre (ISFSI)	-	4701D	DC
Savannah River Site	-	7001	
Seabrook	5901	5901	
Seabrook (ISFSI)	-	5901D	DC
Sequoyah - Unit 1	4808	4808	CP
Sequoyah - Unit 2	4809	4808	CP
Sequoyah (ISFSI)	-	4808D	
Shoreham	2601	2601	

Storage Location	Reactor ID	Storage Site ID	Note
South Texas One - Unit 1	2201	2201	
South Texas One - Unit 2	2202	2202	
South Texas One (ISFSI)	-	2201D	DC
St Lucie - Unit 1	1801	1801	
St Lucie - Unit 2	1802	1802	
St Lucie (ISFSI)	-	1801D	DC
Summer	4601	4601	
Summer (ISFSI)	-	4601D	DC
Surry - Unit 1	5203	5203	CP
Surry - Unit 2	5204	5203	CP
Surry (ISFSI)	-	5203D	DC
Susquehanna - Unit 1	3601	3601	TC
Susquehanna - Unit 2	3602	3601	TC
Susquehanna (ISFSI)	-	3601D	DC
Three Mile Island - Unit 1	1901	1901	
Trojan	3801	3801	
Trojan (ISFSI)	-	3801D	DC
Turkey Point - Unit 3	1803	1803	
Turkey Point - Unit 4	1804	1804	
Turkey Point (ISFSI)	-	1803D	DC
Vermont Yankee	6001	6001	
Vermont Yankee (ISFSI)	-	6001D	DC
Vogtle - Unit 1	2003	2003	TC
Vogtle - Unit 2	2004	2003	TC
Vogtle (ISFSI)	-	2003D	DC
Washington Hanford	-	7007	
Waterford 3	2701	2701	
Waterford 3 (ISFSI)	-	2701D	DC
Watts Bar - Unit 1	4810	4810	CP
Watts Bar - Unit 2	4811	4810	CP
Watts Bar (ISFSI)	-	4810D	DC
Wolf Creek	2501	2501	
Wolf Creek (ISFSI)	-	2501D	DC
Yankee Rowe	5601	5601	
Yankee Rowe (ISFSI)	-	5601D	DC
Zion - Unit 1	1012	1012	CP
Zion - Unit 2	1013	1012	CP
Zion (ISFSI)	-	1012D	DC

TC: Transfer Canal

CP: Common Pool Serving Two or More Reactors

DC: Dry Storage Site

ISFSI: Independent Spent Fuel Storage Installation

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 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 (MWDt/MTU).

Average Initial Enrichment: Average initial enrichment for a fresh fuel assembly as specified and ordered in fuel cycle planning. This average should include axial blankets, and axially and radially zoned enrichments.

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 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/MTU).

Canister: A single assembly canister is defined as any container designed to confine waste that may be delivered to a DOE facility**.** A canister 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 canister or an assembly skeleton).

Consolidated Fuel: Fuel rods are removed from an assembly and placed into a canister 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.

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 fissionable uranium is increased above its natural level. Enrichment is the process that changes the isotopic ratio in a material.

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 or plutonium, by weight, that is present in 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).

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.

Planar-Average Initial Enrichment: The average of the distributed fuel rod initial enrichments within a given axial plane of the assembly lattice.

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.

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

GC-859

NUCLEAR FUEL DATA SURVEY

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.

APPENDIX E – FUEL ASSEMBLY TYPE CODES

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

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva	GAIA	GAIA features may be used in Areva-manufactured fuel assemblies for BW 15x15 reactors.	B1515AG
Areva	Mark B-HTP	High thermal performance (HTP) spacers; FUELGUARD^{TM} lower tie plate	B1515AH
B&W	Mark B	Generic designation for B&W-manufactured fuel for B&W 15 x 15 reactors; used when specific Mark Bx design has not been determined.	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 B 2	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.	B1515B2
B&W	Mark B 3	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.	B1515B3
B&W	Mark B 4	B&W-manufactured fuel for B&W 15 X 15 reactors; standard fuel from B&W for many years; Inconel spacer grids.	B1515B4
B&W	Mark B 4Z	B&W-manufactured fuel for B&W 15 X 15 reactors; has 6 zircaloy grid spacers in the core zone.	B1515B4Z
B&W	Mark B 5	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.	B1515B5
B&W	Mark B 5Z	Mark B5 fuel characteristics with 6 zircaloy grid spacers.	B1515B5Z
B&W	Mark B 6	B&W-manufactured fuel for B&W 15 X 15 reactors; assemblies have 6 zircaloy grid spacers in the core zone and a skirtless and removable upper end fitting.	B1515B6
B&W	Mark B 7	B&W-manufactured fuel for B&W 15 X 15 reactors; in addition to the Mark B6 features, Mark B7 fuel has slightly longer fuel rods and a shorter lower end fitting; these features increase the plenum volume and fuel rod-to-nozzle gap, allowing for increased discharge burnups.	B1515B7
B&W	Mark B 8	B&W-manufactured fuel for B&W 15 X 15 reactors; in addition to the features of discharge burnups. Mark B7 fuel, the Mark B8 fuel has a debris fretting resistant fuel rod design	B1515B8

Vendor	Fuel Design	Distinguishing Features	FA Type Code
B&W	Mark B 9	B&W-manufactured fuel for B&W 15 X 15 reactors; Mark B8 features plus slightly increased pellet diameter and reduced stack length	B1515B9
B&W	Mark B 9Z	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 BEB	LTA for extended burnup features; used only at ANO 1.	B1515BEB
B&W	Mark BGd	LTA using gadolinia at neutron absorber; used only at Oconee 1.	B1515BGD
B&W	Mark BZ	Generic designation for B&W-manufactured fuel with zircaloy spacer grids for B&W 15 x 15 reactors; used when specific Mark Bx design has not been determined. Encompasses Mark B4Z, B5Z, B6, B7, and B8 fuels.	B1515BZ
W		W-manufactured fuel for BW 15x15 reactors.	B1515W
		Other Fuel Assembly Type not otherwise described. Includes Lead Test Assemblies/Lead Use Assemblies. Submit details of the new fuel assembly design so a fuel code can be developed.	B15_OTH
B&W		Four LTAs irradiated in Oconee 2 to demonstrate BW 17x17 fuel. No BW 17x17 reactors completed construction.	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	GAIA	GAIA features may be used in Areva-manufactured fuel assemblies for CE 14 x 14 reactors.	C1414AG
Areva	HTP	M5 Cladding, Advanced fuel rod geometry, Z-4 MONOBLOC^{TM} 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^{TM} guide tubes; gadolinia burnable absorbers, FUELGUARD^{TM} 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	NGF	W-manufactured Next Generation Fuel for CE 14 x 14 reactors.	C1414WN
W	Turbo	CE/W fuel for CE 14 x 14 reactors, with flow mixers on the spacer grids and I-springs.	C1414WT
		Other Fuel Assembly Type not otherwise described. Includes Lead Test Assemblies/Lead Use Assemblies. Submit details of the new fuel assembly design so a fuel code can be developed.	C14_OTH

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

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva (ANF)		ANF-manufactured fuel for CE 16 x 16 reactors.	C1616A
Areva	GAIA	GAIA features may be used in Areva-manufactured fuel assemblies for CE 16 x 16 reactors.	C1616AG
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^{TM} guide tubes; gadolinia burnable absorbers, FUELGUARD^{TM} 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^{TM} cladding; intermediate flow mixers; ZrB2 integral burnable absorbers and axial blankets; GUARDIAN^{TM} bottle nozzles and longer, solid fuel rod lower end plug.	C1616WN
W	Turbo	CE/W fuel for CE 16 x 16 reactors, with flow mixers on the spacer grids and I-springs.	C1616WT
		Other Fuel Assembly Type not otherwise described. Includes Lead Test Assemblies/Lead Use Assemblies. Submit details of the new fuel assembly design so a fuel code can be developed.	C16_OTH

E.4 Combustion Engineering (CE) System 80

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva	GAIA	GAIA features may be used in Areva-manufactured fuel assemblies for CE System 80 reactors.	C8016AG
Areva	HTP	Areva-manufactured fuel for System 80 reactors. Features include M5 Cladding, Advanced fuel rod geometry, HTP spacer grids, Z-4 MONOBLOC^{TM} guide tubes; gadolinia burnable absorbers, FUELGUARD^{TM} bottom nozzle	C8016AH
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^{TM} cladding; intermediate flow mixers; ZrB2 integral burnable absorbers and axial blankets; GUARDIAN^{TM} bottle nozzles and longer, solid fuel rod lower end plug.	C8016WN
		Other Fuel Assembly Type not otherwise described. Includes Lead Test Assemblies/Lead Use Assemblies. Submit details of the new fuel assembly design so a fuel code can be developed.	C80_OTH

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

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva (ANF)	7 x 7	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	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)	8 x 8	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)	8 x 8 Pre-pres.	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.	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; introduces axially zoned enrichments and burnable absorbers; fuel rod prepressurization increased to 5 atmospheres; 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; ferrule-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
GE	QUAD+SVEA-64	8x8 fuel lattice with integral water cross separating 4 mini 4x4 fuel bundles.	G2308W

NUCLEAR FUEL DATA SURVEY

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva (ANF)	9 x 9-1	ANF-manufactured fuel for GE BWR/2,3 reactors; 9X9 fuel rod array; 1 water rods; ~168 kg U.	G2309A
Areva (ANF)	9 x 9-2	ANF-manufactured fuel for GE BWR/2,3 reactors; 9X9 fuel rod array; 2 water rods; ~168 kg U.	G2309A2
Areva (ANF)	9 x 9-5	ANF-manufactured fuel for GE BWR/2,3 reactors; 5 water rods per assembly; estimated 161 kg U.	G2309A5
Areva (ANF)	9X	ANF-manufactured fuel for GE BWR/2,3 reactors; uses a central water channel that replaces 9 water rods; estimated 153 kg U.	G2309A9X
Areva (ANF)	Atrium 9B	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 (ANF)	IX+	ANF-manufactured fuel for GE BWR/2,3 reactors; central water channel replaces 9 fuel rods; high-performance thermal spacers; estimated 153 kg U.	G2309AX+
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	G2310A
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
Areva	Atrium-10XP	8 inconel-718 ULTRAFLOW™ spacer grids, 10 part-length fuel rods, 3 water channel crowns; 10.28 mm fuel rod diameter	G2310AXP
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	G2311A
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	GE13	9x9 bundle, with 74 fuel rods (66 full-length and 8 part-length rods) and 2 large water rods. Adds 8th spacer grid.	G2309G13
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
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).	G2310GG3

Vendor	Fuel Design	Distinguishing Features	FA Type Code
W	SVEA-100	10x10 fuel lattice with integral water cross separating 4 mini 5x5 fuel bundles.	G2310W
W	SVEA-96 Optima	10x10 fuel lattice with 96 fueled rods, including 76 regular full-length rods, 8 long part-length rods, and 12 increased diameter full-length rods; water cross with centralized water channel.	G2310WO
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
W	Optima3	Similar to Optima2 fuel, with simplified top spacer and bottom tie plate (non-tie rods rest freely on the bottom tie plate); shorter end plugs/longer cladding tube, new sleeve-type spacer design.	G2310WO3
W	Triton11	11x11 fuel lattice using HiFi$^{\text{TM}}$ cladding; three cylindrical water rods, 109 fueled rod, including 91 full-length rods, 8 long part-length fuel rods, and 10 short part-length fuel rods; ADOPT$^{\text{TM}}$ doped fuel pellets	G2311WTr
		Other Fuel Assembly Type not otherwise described. Includes Lead Test Assemblies/Lead Use Assemblies. Submit details of the new fuel assembly design so a fuel code can be developed.	G23_OTH

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
GE	GE-3a	GE-manufactured fuel for GE BWR/4-6 reactors; "Improved" fuel; cladding thickness of 0.037"; hydrogen getter introduced; 144 inch active fuel length; ~187 kg U.	G4607G3a
GE	GE-3b	GE-manufactured fuel for GE BWR/4-6 reactors; "Improved" fuel; cladding thickness of 0.037"; hydrogen getter introduced; 146 active length; ~190 kg U.	G4607G3b
Areva (ANF)	8 x 8	ANF-manufactured fuel for GE BWR/4-6 reactors; 8 X 8 fuel rod array; 1 water rod; ~176 kg U.	G4608A
Areva (ANF)	8 x 8 Pre-pres.	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.	G4608G10
GE	GE-11	8x8 bundle with a G11 design for specific Lead Test Assemblies in Cooper Station (3001)	G4608G11
GE	GE-4a	GE-manufactured fuel for GE BWR/4-6 reactors; first 8 X 8 fuel; 1 water rod; 144 inch active fuel length; ~184 kg U.	G4608G4a
GE	GE-4b	GE-manufactured fuel for GE BWR/4-6 reactors; first 8 X 8 fuel; 1 water rod; 146 inch active fuel length; ~187 kg U.	G4608G4b
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	Pre-pres.	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	QUAD+	8x8 fuel lattice with integral water cross separating 4 mini 4x4 fuel bundles.	G4608W
Areva (ANF)	9 x 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)	9 x 9-5	ANF-manufactured fuel for GE BWR/4-6 reactors; 5 water rods per assembly; estimated 168 kg U.	G4609A5
Areva (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)	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)	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
Areva	Atrium-10XP	8 inconel-718 ULTRAFLOW™ spacer grids, 10 part-length fuel rods, 3 water channel crowns; 10.28 mm fuel rod diameter	G4610AXP
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

Vendor	Fuel Design	Distinguishing Features	FA Type Code
W	SVEA-100	W-manufactured SVEA fuel for BWR/4-6 reactors. 10x10 fuel lattice with integral water cross separating 4 mini 5x5 fuel bundles.	G4610W
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	SVEA-96 Optima	10x10 fuel lattice with 96 fueled rods, including 76 regular full-length rods, 8 long part-length rods, and 12 increased diameter full-length rods; water cross with centralized water channel.	G4610WO
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
W	Optima3	Similar to Optima2 fuel, with simplified top spacer and bottom tie plate (non-tie rods rest freely on the bottom tie plate); shorter end plugs/longer cladding tube, new sleeve-type spacer design.	G4610WO3
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
W	Triton11	11x11 fuel lattice using HiFi™ cladding; three cylindrical water rods, 109 fueled rod, including 91 full-length rods, 8 long part-length fuel rods, and 10 short part-length fuel rods; ADOPT™ doped fuel pellets	G4611WTr
		Other Fuel Assembly Type not otherwise described. Includes Lead Test Assemblies/Lead Use Assemblies. Submit details of the new fuel assembly design so a fuel code can be developed.	G46_OTH

E.7 Westinghouse (W), 14x14 Fuel

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva (ANF)		ANF-manufactured fuel for W 14 x 14 reactors.	W1414A
Areva	GAIA	GAIA features may be used in Areva-manufactured fuel assemblies for W 14 x 14 reactors.	W1414AG
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^{TM} guide tubes; gadolinia burnable absorbers, FUELGUARD^{TM} bottom nozzle	W1414AH
Areva (ANF)	Top Rod	ANF-manufactured fuel for WE 14 x 14 reactors; "Top Rod" fuel.	W1414ATR
B&W		B&W-manufactured fuel for W 14 x 14 reactors.	W1414B
W	Standard	W-manufactured fuel for WE 14 x 14 reactors; zircaloy cladding, stainless steel guide tubes; ~394 kg U.	W1414W
W	LOPAR	W-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	NGF	W-manufactured Next Generation Fuel for W 14 x 14 reactors. Optimized ZIRLO^{TM} cladding, axial blanket pellets, WIN top nozzle	W1414WN
W	OFA	W-manufactured fuel for W 14 x 14 reactors; Optimized Fuel Assembly; zircaloy spacer grids; ~358 kg U/assembly	W1414WO
W	Performance+	Vantage+ fuel with low cobalt top and bottom nozzles, ZrO2 coated lower fuel rods, ZIRLO mid-grids, and mid-enrichment of the annular or solid pellets in axial blankets.	W1414WP
W	RFA	Robust Fuel Assembly for use at W 14x14 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.	W1414WR
W	RFA-2	Robust Fuel Assembly 2 for use at W 14x14 plants. Features include Optimized ZIRLO^{TM} cladding, heat transfer improvements, ZrB2 integral burnable absorbers, enhanced debris mitigation, and reduced enrichment axial blankets.	W1414WR2
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
		Other Fuel Assembly Type not otherwise described. Includes Lead Test Assemblies/Lead Use Assemblies. Submit details of the new fuel assembly design so a fuel code can be developed.	W14_OTH

E.8 Westinghouse (W), 15x15 Fuel

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva (ANF)		ANF-manufactured fuel for WE x 15 reactors.	W1515A
Areva	AGORA®	M5 cladding; evolution of the European AFA 3G™ design.	W1515AAg
Areva	GAIA	GAIA features may be used in Areva-manufactured fuel assemblies for W 15x15 reactors.	W1515AG
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)	Part Length	Part-length assembly used for shielding purposes.	W1515APL
W	Standard	W-manufactured fuel for W 15 x 15 reactors; zircaloy cladding, stainless steel guide tubes; ~454 kg U.	W1515W
W	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	NGF	W-manufactured Next Generation Fuel for W 15 x 15 reactors. Optimized ZIRLO™ cladding, 0.374" diameter fuel rods, axial blanket pellets, WIN top nozzle	W1515WN
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, ZrO2 coated lower fuel rods, ZIRLO mid-grids, and mid-enrichment of the annular or solid pellets in axial blankets.	W1515WP
W	RFA	Robust Fuel Assembly for use at W 15x15 plants. RFA fuel is based on Vantage+ fuel, and features include Optimized ZIRLO™ 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.	W1515WR
W	RFA-2	Robust Fuel Assembly 2 for use at W 15x15 plants. Features include Optimized ZIRLO™ cladding, heat transfer improvements, ZrB2 integral burnable absorbers, enhanced debris mitigation, and reduced enrichment axial blankets.	W1515WR2
W	Vantage 5+	W-manufactured fuel for W 15 x 15 reactors, combines ZIRLO cladding with the other characteristics of Vantage 5 fuel; estimated 426 kg U.	W1515WV+
W	Vantage 5	W-manufactured fuel for W 15 x 15 reactors; integral ZrB2 neutron absorbers in fuel; natural uranium axial blankets; IFMs; removable top nozzle; increased discharge burnup; other OFA features; ~461 kg U.	W1515WV5

Vendor	Fuel Design	Distinguishing Features	FA Type Code
W	Vantage 5H	W-manufactured fuel for W 15 x 15 reactors; hybrid fuel with advanced neutronic features of Vantage 5 fuel and larger fuel rod diameter associated with LOPAR fuel; ~ 464 kg U.	W1515WVH
		Other Fuel Assembly Type not otherwise described. Includes Lead Test Assemblies/Lead Use Assemblies. Submit details of the new fuel assembly design so a fuel code can be developed.	W15_OTH

E.9 Westinghouse (W), 17x17 Fuel

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva (ANF)		Advanced Nuclear Fuels reload fuel for W 17 x 17 reactors.	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	Mark BW	Original B&W/Framatome reload fuel for W 17 x 17 reactors; features include flexibility in the spacer grid/guide tube connection and; Trapper(TM) bottom nozzle.	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	W-manufactured fuel for W 17 x 17 reactors; Optimized Fuel Assembly; 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 ZrB2 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, ZrB2 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 ZrB2 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+	W-manufactured fuel for W 17 x 17 reactors, Vantage 5H features with ZIRLO^{TM} cladding	W1717WVJ
		Other Fuel Assembly Type not otherwise described. Includes Lead Test Assemblies/Lead Use Assemblies. Submit details of the new fuel assembly design so a fuel code can be developed.	W17_OTH

E.10 Reactor Specific Fuel Codes

Dresden

Vendor	Fuel Design	Distinguishing Features	FA Type Code
Areva (ANF)		ANF-manufactured fuel for use at Dresden 1; ~95 kg U.	XDR06A
GE		GE-manufactured fuel for use at Dresden 1; all but one assembly reprocessed at West Valley; ~111 kg U.	XDR06G
GE		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		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		GE-manufactured fuel for use at Dresden 1; gadolinium oxide as a burnable absorber in selected fuel rods; ~106 kg U.	XDR06G5
UNC		UNC-manufactured fuel for use at Dresden 1; ~102 kg U.	XDR06U
GE		GE-manufactured fuel for use at Dresden 1; stainless steel clad fuel; 9 thorium oxide corner rods; all reprocessed at West Valley except for the corner rods, which were shipped to the Savannah River Site.	XDR07G
GE		GE-manufactured fuel for use at Dresden 1; a single prototype fuel assembly manufactured and owned by GE.	XDR07GS
GE		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
		Other Fuel Assembly Type not otherwise described. Includes Lead Test Assemblies/Lead Use Assemblies. Submit details of the new fuel assembly design so a fuel code can be developed.	XDR_OTH

Fort Calhoun

Vendor	Fuel Design	Distinguishing Features	FA Type Code
ANF		ANF-manufactured fuel for Fort Calhoun reactor.	XFC14A
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
		Other Fuel Assembly Type not otherwise described. Includes Lead Test Assemblies/Lead Use Assemblies. Submit details of the new fuel assembly design so a fuel code can be developed.	XFC_OTH

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^{TM} guide tubes; gadolinia burnable absorbers, FUELGUARD^{TM} bottom nozzle.	XPA15AH
CE		CE-manufactured fuel for Palisades reactor.	XPA15C
		Other Fuel Assembly Type not otherwise described. Includes Lead Test Assemblies/Lead Use Assemblies. Submit details of the new fuel assembly design so a fuel code can be developed.	XPA_OTH

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^{TM} guide tubes; gadolinia burnable absorbers, FUELGUARD^{TM} bottom nozzle.	XSL16AH
CE		CE-manufactured fuel for St. Lucie 2 reactor.	XSL16C
W		W manufactured fuel for St. Lucie 2 reactor.	XSL16W
		Other Fuel Assembly Type not otherwise described. Includes Lead Test Assemblies/Lead Use Assemblies. Submit details of the new fuel assembly design so a fuel code can be developed.	XSL_OTH

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^{TM} 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
		Other Fuel Assembly Type not otherwise described. Includes Lead Test Assemblies/Lead Use Assemblies. Submit details of the new fuel assembly design so a fuel code can be developed.	WST_OTH