

## FORM GC-859 NUCLEAR FUEL DATA SURVEY

OMB NO. xxxx-xxxx Expiration Date: xx/xx/xxxx

Burden: 90 Hours

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***](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** |

# SCHEDULE A: SITE OPERATOR DATA

#### Site Operator Name/Identifier

###### Site Operator Name:

* + 1. **List all reactors being covered by this report**.

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

|  |  |
| --- | --- |
| **Reactor Identifier** | **Reactor Name** |
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###### 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** |
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#### 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:

#### 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** |
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# SCHEDULE B: REACTOR DATA

#### 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:

#### Reactor License Data

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

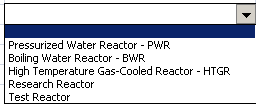
##### Reactor Identifier

(See Appendix C, “Reactor and Spent Fuel Storage Site Identification Codes.”)

* + 1. **NRC License Expiration Date** (MM/DD/YYYY): / /

##### NRC License Type:

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.

* + 1. **Reactor Type:**

### 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** |
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#### Cycle Data

Provide the following data for all operating cycles.

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

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

|  |  |  |
| --- | --- | --- |
| **Cycle Number** | **Start Up Date (MM/DD/YYYY)** | **Shutdown Date (MM/DD/YYYY)** |
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### COMMENTS

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

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| --- | --- |
| **Schedule and Item Number** | **Comment** |
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# SCHEDULE C: FUEL DATA

#### 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**  **I** | **Assembly Identifier** | The unique operator-assigned identifier or the American National Standards Institute (ANSI) identifier. The identifier indicated as the “Primary” assembly identifier should be used throughout the survey form. |
| **2 I** | **Initial Heavy Metal Content** | The initial heavy metal content (uranium) of the fuel assembly in kilograms (reported to the nearest thousandth of a kilogram). |
| **3 I** | **Initial 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 (MWDt/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 Component1** | The type of non-fuel component that is integral to that assembly.  Graphical user interface, text, application, chat or text message  Description automatically generated |
| **11**  **12** | **Non-fuel Component Identifier**  **Estimated Total Weight** | The alphanumeric characters which identified the non-fuel component that is integral to that assembly.  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.

##### 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.

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| **1** | | **2** | **3** | **4** | **5** | **6** | **7** | **8** | | | | | | | **9** | **10** | **11** | **12** |
| **Assembly Identifier** | | **Initial Heavy Metal Content** | **Initial Enrichment (Weight %)** | **Mixed Oxide Fuel Data1** | **Discharge Burnup (MWDt/MTU)** | **Last Cycle Number** | **Fuel Assembly Type Code2** | **Assembly Status Indicators** | | | | | | | **Storage Location** | **NFC3** | **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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|  |  |  |  | □ |  |  |  | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ |  |  |  |  |
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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 (239Pu and 241Pu).

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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### 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.

|  |  |
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| **Schedule and Item Number** | **Comment** |
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##### 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.”

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Assembly Identifier** | **Reactor Cycle Numbers** | | | | | | **Cumulative Burnup for Each Cycle (MWDt/MTU)** | | | | | |
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### COMMENTS

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

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| --- | --- |
| **Schedule and Item Number** | **Comment** |
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##### 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** |
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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** |
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#### 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.”

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| --- | --- | --- |
| **Assembly Identifier** | **Original Storage Site Identifier** | **Current Storage Site Identifier** |
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### 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** |
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#### Projected Assembly Discharges

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

#### 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)

##### 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.

###### Single Assembly Canisters Description

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Canister Identifier** | **Canister Shape** | | **Canister Dimensions (to the nearest 0.1 inch)** | | | **Loaded Weight (to nearest lb.)** | **Storage Identifier1** |
| **C** | **R** | **Length** | **Diameter/ Width** | **Depth** |
|  | ❑ | ❑ |  |  |  |  |  |
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C = cylindrical R = rectangular

1See Appendix C, “Reactor and Spent Fuel Storage Site Identification Codes.”

###### 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

###### 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 Identifier1** | **Number of Fuel Rod Equivalents from Assembly** | **Initial Heavy Metal Content2** | **Discharge Burnup3 (MWDt/MTU)** |
| **Initial kgU** |
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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.

### 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** |
|  |  |
|  |  |
|  |  |

##### 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 Identifier1** | **Number of Uncanistered Fuel Rods or Pieces from Assembly** | **Initial Heavy Metal**  **Content2** | **Discharge Burnup3 (MWDt/MTU)** |
| **Initial kgU** |
|  |  |  |  |
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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.

### 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** |
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|  |  |

##### Special Fuel Form – Consolidated/Reconstituted/Reconstructed Assemblies; Dimensionally or Other Than LWR Non-Standard Assemblies; & Failed Fuel

###### 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.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type1** | **Current Location (Assembly Identifier)** | **Source Assembly Identifier2** | **Number of Rods from Source Assembly (or other location)** | **Initial Heavy**  **Metal Content3** | **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.

### 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** |
|  |  |
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###### 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**  **Identifier1** | **Description of Non-Standard Assembly** |
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1 Assembly Identifier must match the primary assembly identifier in Section C.1.1 of the current or prior data collection, whichever is applicable.

All fuel from this reactor is considered non-standard.

### COMMENTS

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

|  |  |
| --- | --- |
| **Schedule and Item Number** | **Comment** |
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###### 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**  **Identifier1** | **Failed Fuel Class2** | **Description of Failure** |
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|  |  |  |
|  |  |  |

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

### 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** |
|  |  |
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#### 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.

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

Domestic

International

Both Domestic and International

##### What quantity of discharged fuel will be reprocessed?

(Metric Tons)

* + 1. **Provide details as to the type of waste anticipated to be generated.**

|  |
| --- |
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### COMMENTS

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

|  |  |
| --- | --- |
| **Schedule and Item Number** | **Comment** |
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# SCHEDULE D: STORAGE FACILITY DATA

#### 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:

### 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** |
|  |  |
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|  |  |

#### Storage Facility Information (Pool Storage)

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

##### Storage Site Identifier

(See Appendix C, “Reactor and Spent Fuel Storage Site Identification Codes.”)

##### 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.

##### 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** |  |

### 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** |
|  |  |
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#### 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.

##### Storage Site Identifier

(See Appendix C, “Reactor and Spent Fuel Storage Site Identification Codes.”)

##### 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** |
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| **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.

### 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** |
|  |  |
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##### 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 Identifier1** | **Position According to Map** |
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1 Assembly Identifier must match the primary assembly identifier in Section C.1.1 of the current or prior data collection, whichever is applicable.

### COMMENTS

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

|  |  |
| --- | --- |
| **Schedule and Item Number** | **Comment** |
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# SCHEDULE E: NON-FUEL DATA

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

#### 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.

#### 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.

#### 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**

|  |
| --- |
| 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: |
|  |
|  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Canister Identifier** | **Canister Shape** | | **Canister Dimensions (to nearest 0.1 inch)** | | | **Loaded Weight (lbs)1** | **Type of Non-fuel Component2** | **Number of Individual Items** | **Canister Closure** | | | **Is Canister Handled As A Standard Fuel**  **Assembly? 3** | | **Storage Location4** |
| **C** | **R** | **Length** | **Diameter/**  **Width** | **Depth** | **B** | **W** | **NC** | **Yes** | **No** |
|  | ❑ | ❑ |  |  |  |  | P2139C27T47#yIS1 |  | ❑ | ❑ | ❑ | ❑ | ❑ |  |
|  | ❑ | ❑ |  |  |  |  |  |  | ❑ | ❑ | ❑ | ❑ | ❑ |  |

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”.

### 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** |
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#### 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: |  |  |
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### 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** |
|  |  |
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# SCHEDULE F: GREATER-THAN-CLASS-C WASTE DATA

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

#### 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:

### 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.

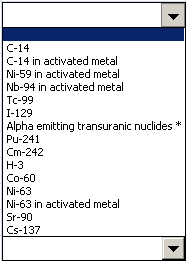
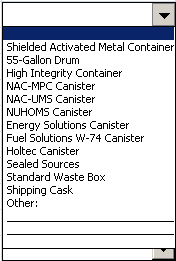
|  |  |
| --- | --- |
| **Schedule and Item Number** | **Comment** |
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#### Stored Inventory

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

##### 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.



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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pack aged Volume (ft3)1** | **Pack age Contents2** | **Pack aging3** | | **Package Dimensions** | | | | **Loaded Weight of**  **Pack age (lbs)** | **Date Pack aged** | **Total Pack age Activity4 (MCi)** | **Radionuclide5** | | **Remotely Handled6** | | **Date of Last Criticality**  **(MM/YYYY)7** | **Latest Date of Segmentation (MM/YYYY)8** |
| **Type** | **Number** | **External Length (in)** | **External Diameter (in)** | **External Volume (ft3)** | **Internal Volume (ft3)** | **Yes** | **No** |
|  |  |  |  |  |  |  |  |  |  |  | 1 |  | ❑ | ❑ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | ❑ | ❑ |  |  |
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|  |  |  |  |  |  |  |  |  |  |  |  | | ❑ | ❑ |  |  |

**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

### COMMENTS

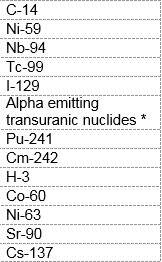
Provide any comments you have concerning GTCC Stored Inventory - Activated Metals (Section F.2.1) in the comment section below. Label your comments by the **Schedule and Item Number** to which they refer.

|  |  |
| --- | --- |
| **Schedule and Item Number** | **Comment** |
|  |  |
|  |  |
|  |  |

##### 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.





**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

### 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** |
|  |  |
|  |  |
|  |  |

#### Projected Inventory (2023-2070)

##### 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 Waste1** | **Estimated Unpackaged Volume2 (ft3)** | **Estimated Packaged Volume3 [If known]**  **(ft3)** |
| 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 (ft3):** Volume of only the waste without any storage container.

**3 Estimated Packaged Volume (ft3):** Volume of the waste including any storage container.

### COMMENTS

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

|  |  |
| --- | --- |
| **Schedule and Item Number** | **Comment** |
|  |  |
|  |  |
|  |  |

##### 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 Waste1** | **Estimated Unpackaged Volume2 (ft3)** | **Estimated Packaged Volume3 [If known]**  **(ft3)** | **RCRA Listed Hazardous Waste Constituents or Characteristics4** |
| 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 (ft3):** Volume of only the waste without any storage container.

**3 Estimated Packaged Volume (ft3):** Volume of the waste including any storage container.

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

### COMMENTS

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

|  |  |
| --- | --- |
| **Schedule and Item Number** | **Comment** |
|  |  |
|  |  |
|  |  |

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

**General Instructions**

###### 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.

###### Who Should Submit

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

###### 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**.

###### 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.

###### Where To Submit

Please use the following website to submit your data: [*https://gc859.pnnl.gov*.](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.

###### Legal Authority and Sanctions Statement

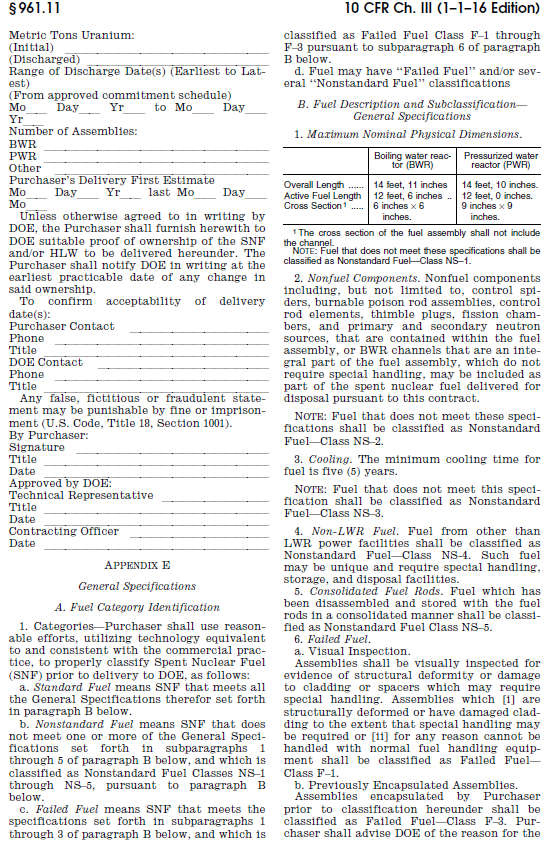
Data on this mandatory form are collected under authority of the Federal Energy Administration Act of 1974 (15 USC Schedule 761 et seq.), and the Nuclear Waste Policy Act of 1982 (42 USC 10101 et seq.). Data being collected on this form are not considered to be confidential.

**Specific Instructions**

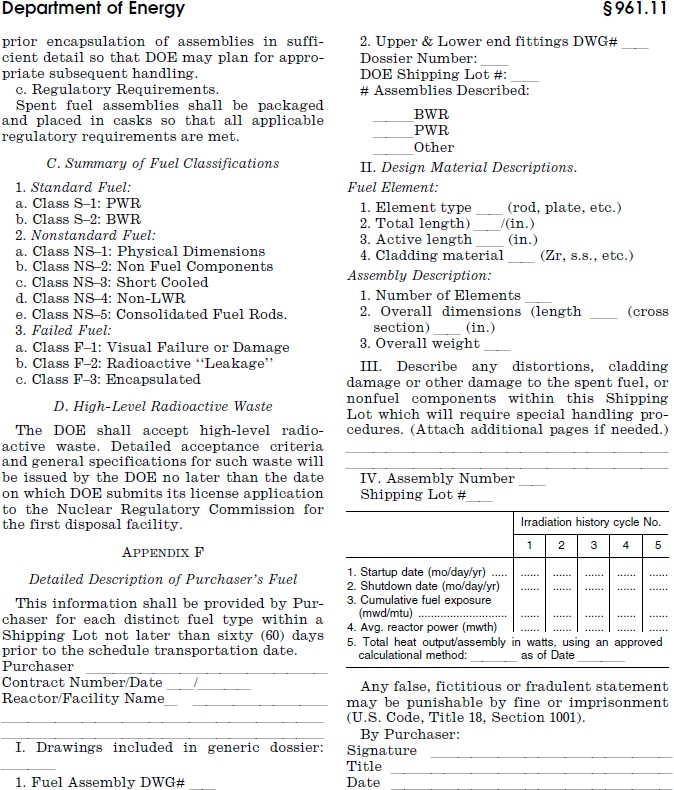
Instructions for filing the individual Schedules of the Form GC-859 survey are included within the schedules. Operating instructions for the software are provided with the Form GC-859 data collection system.

# 

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



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# 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 |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Storage Location** | **Reactor ID** | **Storage Site ID** | **Note** |
| 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 (MWDt/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 (UO2) 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

**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

* 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; FUELGUARDTM 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; lnconel 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  lnconel 718 rather than lnconel 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 |

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| **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 |

* 1. **Combustion Engineering (CE), 14x14 Fuel**

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| **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 MONOBLOCTM 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 MONOBLOCTM guide tubes; gadolinia burnable  absorbers, FUELGUARDTM 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 |

* 1. **Combustion Engineering (CE), 16x16 Fuel**

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| **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 MONOBLOCTM guide tubes; gadolinia burnable  absorbers, FUELGUARDTM 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 ZIRLOTM cladding; intermediate flow mixers; ZrB2 integral burnable absorbers and axial blankets; GUARDIANTM  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 |

* 1. **Combustion Engineering (CE) System 80**

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| **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 MONOBLOCTM guide tubes; gadolinia burnable  absorbers, FUELGUARDTM 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 ZIRLOTM cladding; intermediate flow mixers; ZrB2 integral burnable absorbers and axial blankets; GUARDIANTM  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 |

* 1. **General Electric (GE) BWR/2 and BWR/3**

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| **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 |

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| **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 ULTRAFLOWTM spacer grids, 8 part-length fuel rods, 1 water channel, 10.05 mm fuel rod diameter | G2310A |
| Areva | Atrium-10XM | Unique pellet end; Improved FUELGUARDTM filter; 9 inconel-718 ULTRAFLOWTM 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 ULTRAFLOWTM 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 FUELGUARDTM debris filters; 9 ULTRAFLOWTM 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 | DefenderTM 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 |

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| **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 HiFiTM 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; ADOPTTM  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 |

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

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| **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 |

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| **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 ULTRAFLOWTM 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 FUELGUARDTM filter; 9 inconel-718 ULTRAFLOWTM 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 ULTRAFLOWTM 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 | DefenderTM 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 |

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| **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 FUELGUARDTM debris filters; 9 ULTRAFLOWTM spacers, axial load  compression springs | G4611A |
| W | Triton11 | 11x11 fuel lattice using HiFiTM 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; ADOPTTM  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 |

* 1. **Westinghouse (W), 14x14 Fuel**

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| **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 MONOBLOCTM guide tubes; gadolinia burnable  absorbers, FUELGUARDTM 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 ZIRLOTM 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 ZIRLOTM 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 ZIRLOTM 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 |

* 1. **Westinghouse (W), 15x15 Fuel**

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| **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 3GTM 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 MONOBLOCTM guide tubes; gadolinia burnable  absorbers, FUELGUARDTM 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 ZIRLOTM 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 ZIRLOTM 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 ZIRLOTM 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 |

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| **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 |

* 1. **Westinghouse (W), 17x17 Fuel**

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| **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 ZIRLOTM 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 ZIRLOTM cladding, low-cobalt  top and bottom nozzle, enriched axial blankets, enriched ZrB2 pellets, and ZIRLOTM 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 ZIRLOTM 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 ZIRLOTM 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 ZIRLOTM 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 |

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| **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 ZIRLOTM 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 |

* 1. **Reactor Specific Fuel Codes**

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| **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 |

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| **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 |

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| **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 MONOBLOCTM guide tubes; gadolinia burnable absorbers,  FUELGUARDTM 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 |

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| **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 MONOBLOCTM guide tubes; gadolinia burnable absorbers,  FUELGUARDTM 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 |

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| **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; ZIRLOTM 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 ZIRLOTM cladding, heat transfer improvements, ZrB2 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 |