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NUH03-04-036

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U. S. Nuclear Regulatory Commission
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Rockville, MD 20852

Subject: Application for Amendment No. 9 of the NUHOMS® Certificate of Compliance (CoC) No. 1004 for Dry Spent Fuel Storage Casks, Revision 0

References:

1. CoC No. 1004, Amendment No. 5 for the Addition of NUHOMS®-32PT to the Standardized NUHOMS® System.
2. CoC No. 1004, Amendment No. 6 for the Addition of NUHOMS®-24PHB to the Standardized NUHOMS® System.
3. Updated Final Safety Analysis Report (FSAR) for the Standardized NUHOMS® Horizontal Modular Storage for Irradiated Nuclear Fuel, Revision 7 (File NUH003.0103).

Dear Ms. Ross-Lee:

Transnuclear Inc. (TN) herewith submits its subject application to amend the authorized contents of the NUHOMS®-32PT system (Reference 1) and the NUHOMS®-24PHB system (Reference 2).

The Fuel Specification and Fuel Qualification Tables previously approved for the 32PT DSC system are being expanded to include fuel with low enrichment levels and reconstituted fuel. In addition, the 32PT DSC criticality analysis for the CE 14x14, WE 14x14, and CE 15x15 class PWR assemblies is being modified to reflect the minimum boron loading concentration required as a function of the fuel enrichment levels.

For the 24PHB system, the application expands its authorized contents to include CE 14x14, WE 14x14, WE 15x15 and WE 17x17 class PWR assemblies.

TN has contracted with three utilities for dry storage systems which plan to use the revised payload. To support the needs of these utilities for their loading campaigns in mid 2005, TN requests that the staff assign appropriate priority for review of this application consistent with the issuance of an amendment by February 2005.

NMSS01

Enclosure 1 of this submittal is organized in the following format to facilitate your staff's review:

Attachment A: Description, Justification and Evaluation of Amendment Changes,
Attachment B: Suggested Changes to CoC 1004 Technical Specifications and Associated Bases,
Attachment C1: Changed Pages of Appendix M of the Updated FSAR, and
Attachment C2: Changed Pages of Appendix N of the Updated FSAR.

Please note that TN has updated the docketed version of the NUHOMS® FSAR Revision 7 to reflect the recently approved CoC 1004 amendments (References 1 and 2) and the ongoing changes to the NUHOMS® system implemented under the provisions of 10CFR 72.48. Enclosed herewith are the changed pages of Reference 3 to provide a complete evaluation of the requested changes to the NUHOMS® -32PT (Attachment C1) and 24PHB systems (Attachment C2).

TN looks forward to working with you and your staff on this amendment. Should you or your staff require additional information to support review of this application, please do not hesitate to contact me at 510-744-6053 or Mr. Jayant Bondre at 510-744-6043.

Sincerely,



U. B. Chopra
Licensing Manager

Docket 72-1004

Enclosures:

1. Ten (10) copies of Application for Amendment No. 9 to NUHOMS® COC 1004.

ATTACHMENT A

Description, Justification, and Evaluation of Amendment 9 Changes

ATTACHMENT A

DESCRIPTION, JUSTIFICATION AND EVALUATION OF AMENDMENT CHANGES

1.0 INTRODUCTION

The purpose of this application for Amendment No. 9 to CoC 1004 is:

- To expand the NUHOMS[®]-32PT DSC Fuel Specification and Fuel Qualification Tables (FQTs), previously approved per CoC 1004 Amendment No. 5, to include reconstituted fuel assemblies and assemblies with low initial enrichment levels (between 1.1 and 2.0 wt % U-235).
- To revise the 32PT DSC Fuel Specification Table 1-1g to show the minimum soluble boron loading concentration required as a function of the fuel initial enrichment for the CE 14x14, WE 14x14, and CE 15x15 Class PWR fuel assemblies. Also, revise Fuel Specification 1.2.15a to be consistent with this change.
- To add CE 14x14, WE 14x14, WE 15x15, and WE 17x17 Class PWR fuel assemblies to the authorized contents of the NUHOMS[®]-24PHB DSC, that was previously approved per CoC 1004 Amendment No. 6.

This application provides the supporting shielding analysis and criticality analyses for the above listed changes. Thermal, structural, and confinement analyses for the 32PT DSC and 24PHB DSC are not affected by these changes.

This section of the application provides (1) a brief description of the changes, (2) justification for the changes, and (3) a safety evaluation for these changes.

2.0 BRIEF DESCRIPTION OF THE CHANGE

2.1 Significant Changes to the Technical Specifications Relative to NUHOMS[®] CoC 1004, 8

Attachment B of this submittal includes a mark-up of the affected Technical Specifications. The changes listed below are relative to CoC 1004 Amendments 8 which is currently under NRC review:

- For the 32PT DSC, revise Fuel Qualification Tables 1-2d, 1-2e, 1-2f, 1-2g and 1-2h to include fuel assemblies with low enrichment levels and provide cooling times for regions depicted as "Not Analyzed" in these specific Tables. Also, revise these Tables to indicate cooling time requirements for reconstituted fuel assemblies.
- For the 32PT DSC, revise Fuel Specification Table 1-1e to include reconstituted fuel assemblies. Also, revise Table 1-1f to clarify that CE 15x15 fuel assemblies with stainless steel plugging clusters are acceptable.

- For the 32PT DSC, revise Fuel Specification Table 1-1g to include variable soluble boron loading as a function of initial enrichment for CE 14x14, CE 15x15 and WE 14x14 assembly class.
- For the 32PT DSC, revise "Limit/Specification" section of Specification 1.2.15a to delete 2500 ppm and add reference to Table 1-1g.
- For the 24PHB DSC, revise Table 1-1i to include storage of WE 17x17, WE 15x15, CE 14x14 and WE 14x14 PWR assembly class to the 24PHB DSC.

In addition, TN requests two minor changes to the Technical Specifications which provide clarification and consistency to the contents of Technical Specifications without altering the intent of the Specifications.

- Revise Technical Specification 1.2.10 and 1.2.13 to add clarification regarding the restriction of DSC handling outside the Spent Fuel Pool Building. This is a clarification change.
- Revise Technical Specification 1.2.12 to provide clarification to the intent of the Action Statement a.

2.2 Changes to Updated NUHOMS® FSAR, Revision 7

TN has maintained an Updated NUHOMS® FSAR Revision 7 to reflect ongoing changes to the FSAR under the provisions of 10CFR72.248. This Updated NUHOMS® FSAR Revision 7 includes the following major changes to the contents of the FSAR Revision 7 implemented since its docketing in November 2003:

- Approval of Amendment No. 5 to CoC 1004 in January 2004 authorizing the use of NUHOMS®-32PT DSC for storage of spent fuel (Addition of Appendix M to the FSAR contents),
- Approval of Amendment No. 6 to CoC 1004 in December 2003 authorizing the use of NUHOMS®-24PHB DSC for storage of spent fuel (Addition of Appendix N to the FSAR), and
- Following approval of Amendments 5 and 6 listed above, TN implemented a few additional changes to the 32PT DSC and 24PHB DSC design and procedures under the provisions of 10CFR 72.48.

Attachments C-1 and C-2 of this submittal include revised and new pages for the Updated FSAR Appendices M and N, respectively. These updated pages are prepared in a format consistent with the Standard Review Plan for Dry Cask Storage (NUREG 1536).

Attachments C-1 and C-2 provide a complete supporting evaluation of the changes to the NUHOMS®-32PT and 24PHB System requested under this application.

3.0 JUSTIFICATION OF CHANGE

Nuclear Management Company (NMC) and Dominion Nuclear Connecticut (DNC) have contracted with TN to use the NUHOMS®-32PT system to store fuel assemblies with the revised parameters as described in this application at their Palisades and Millstone Nuclear Plants, respectively. Similarly, Progress Energy (PE) is considering an option to use 24PHB DSC to store fuel with these revised parameters at their Robinson Nuclear Plant.

To support the needs of NMC, DNC, and PE, TN requests that the staff assign appropriate priority for review of this application which is consistent with a February 2005 effective date for the amended CoC.

4.0 EVALUATION OF CHANGE

TN has evaluated the NUHOMS®-32PT and NUHOMS®-24PHB systems for structural, thermal, shielding and criticality adequacy and has concluded that the storage of PWR fuel with the revised parameters in the NUHOMS®-32PT and additional fuel types in the NUHOMS®-24PHB Systems have no significant effect on safety. This evaluation is documented in the updated Appendices M and N of the FSAR (Attachments C-1 and C-2, respectively).

ATTACHMENT B

Suggested Changes to Technical Specifications of CoC 1004 Amendment No. 8

(Changes proposed by CoC Amendment 8 have been included as current configuration.)

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1.0 INTRODUCTION

This section presents the conditions which a potential user (general licensee) of the standardized NUHOMS® system must comply with, in order to use the system under the general license in accordance with the provisions of 10 CFR 72.210 and 10 CFR 72.212. These conditions have either been proposed by the system vendor, imposed by the NRC staff as a result of the review of the FSAR, or are part of the regulatory requirements expressed in 10 CFR 72.212.

1.1 General Requirements and Conditions

1.1.1 Regulatory Requirements for a General License

Subpart K of 10 CFR Part 72 contains conditions for using the general license to store spent fuel at an independent spent fuel storage installation at power reactor sites authorized to possess and operate nuclear power reactors under 10 CFR Part 50. Technical regulatory requirements for the licensee (user of the standardized NUHOMS® system) are contained in 10 CFR 72.212(b).

Under 10 CFR 72.212(b)(2) requirements, the licensee must perform written evaluations, before use, that establish that: (1) conditions set forth in the Certificate of Compliance have been met; (2) cask storage pads and areas have been designed to adequately support the static load of the stored casks; and (3) the requirements of 10 CFR 72.104 "Criteria for radioactive materials in effluent and direct radiation from an ISFSI or MRS," have been met. In addition, 10 CFR 72.212(b)(3) requires that the licensee review the FSAR and the associated SER, before use of the general license, to determine whether or not the reactor site parameters (including earthquake intensity and tornado missiles), are encompassed by the cask design bases considered in these reports.

The requirements of 10 CFR 72.212(b)(4) provide that, as a holder of a Part 50 license, the user, before use of the general license under Part 72, must determine whether activities related to storage of spent fuel involve any unreviewed safety issues, or changes in technical specifications as provided under 10 CFR 50.59. Under 10 CFR 72.212(b)(5), the general license holder shall also protect the spent fuel against design basis threats and radiological sabotage pursuant to 10 CFR 73.55. Other general license requirements dealing with review of reactor emergency plans, quality assurance program, training, and radiation protection program must also be satisfied pursuant to 10 CFR 72.212(b)(6). Records and procedural requirements for the general license holder are described in 10 CFR 72.212(b)(7), (8), (9) and (10).

Without limiting the requirements identified above, site-specific parameters and analyses, identified in the SER, that will need verification by the system user, are as a minimum, as follows:

1. The temperature of 70°F as the maximum average yearly temperature with solar incidence. The average daily ambient temperature shall be 100°F or less.
2. The temperature extremes either of 125°F with incident solar radiation (for the 24P, 52B, and 61BT DSCs) or 117°F with solar incidence (for the 32PT, 24PHB, and 24PTH DSCs) and -40°F with no solar incidence for storage of the DSC inside the HSM. The 117°F extreme ambient temperature corresponds to a 24 hour calculated average temperature of 102°F.

3. The horizontal and vertical seismic acceleration levels of 0.25g and 0.17g, respectively.
4. The analyzed flood condition of 15 fps water velocity and a height of 50 feet of water (full submergence of the loaded HSM DSC).
5. The potential for fire and explosion should be addressed, based on site-specific considerations.
6. The HSM foundation design criteria are not included in the FSAR. Therefore, the nominal FSAR design or an alternative should be verified for individual sites in accordance with 10 CFR 72.212(b)(2)(ii). Also, in accordance with 10 CFR 72.212(b)(3), the foundation design should be evaluated against actual site parameters to determine whether its failure would cause the standardized NUHOMS[®] system to exceed the design basis accident conditions.
7. The potential for lightning damage to any electrical system associated with the standardized NUHOMS[®] system (e.g., thermal performance monitoring) should be addressed, based on site-specific considerations.
8. Any other site parameters or consideration that could decrease the effectiveness of cask systems important to safety.

In accordance with 10 CFR 72.212(b)(2), a record of the written evaluations must be retained by the licensee until spent fuel is no longer stored under the general license issued under 10 CFR 72.210.

1.1.2 Operating Procedures

Written operating procedures shall be prepared for cask handling, loading, movement, surveillance, and maintenance. The operating procedures suggested generically in the FSAR should provide the basis for the user's written operating procedure. The following additional procedure requested by NRC staff should be part of the user operating procedures:

If fuel needs to be removed from the DSC, either at the end of service life or for inspection after an accident, precautions must be taken against the potential for the presence of damaged or oxidized fuel and to prevent radiological exposure to personnel during this operation. This can be achieved with this design by the use of the purge and fill valves which permit a determination of the atmosphere within the DSC before the removal of the inner top cover plate and shield plugs, prior to filling the DSC cavity with water (borated water for the 24P or 32PT or 24PHB or 24PTH). If the atmosphere within the DSC is helium, then operations should proceed normally with fuel removal either via the transfer cask or in the pool. However, if air is present within the DSC, then appropriate filters should be in place to preclude the uncontrolled release of any potential airborne radioactive particulate from the DSC via the purge-fill valves. This will protect both personnel and the operations area from potential contamination. For the accident case, personnel protection in the form of respirators or supplied air should be considered in accordance with the licensee's Radiation Protection Program.

1.1.3 Quality Assurance

Activities at the ISFSI shall be conducted in accordance with a Commission-approved quality assurance program which satisfies the applicable requirements of 10 CFR Part 50, Appendix B, and which is established, maintained, and executed with regard to the ISFSI.

1.1.4 Heavy Loads Requirements

Lifts of the DSC in the TC must be made within the existing heavy loads requirements and procedures of the licensed nuclear power plant. The TC design has been reviewed under 10 CFR Part 72 and found to meet NUREG-0612 and ANSI N14.6. However, an additional safety review (under 10 CFR 50.59) is required to show operational compliance with NUREG-0612 and/or existing plant-specific heavy loads requirements.

1.1.5 Training Module

A training module shall be developed for the existing licensee's training program establishing an ISFSI training and certification program. This module shall include the following:

1. Standardized NUHOMS® Design (overview);
2. ISFSI Facility Design (overview);
3. Certificate of Compliance conditions (overview);
4. Fuel Loading, Transfer Cask Handling, DSC Transfer Procedures; and
5. Off-Normal Event Procedures.

1.1.6 Pre-Operational Testing and Training Exercise

A dry run of the DSC loading, TC handling and DSC insertion into the HSM shall be held. This dry run shall include, but not be limited to, the following:

1. Functional testing of the TC with lifting yokes to ensure that the TC can be safely transported over the entire route required for fuel loading, washdown pit (decontamination area) and trailer loading.
2. DSC loading into the TC to verify fit and TC/DSC annulus seal.
3. Testing of TC on transport trailer and transported to ISFSI along a predetermined route and aligned with an HSM.
4. Testing of transfer trailer alignment and docking equipment. Testing of hydraulic ram to insert a DSC loaded with test weights into an HSM and then retrieve it.
5. Loading a mock-up fuel assembly into the DSC.
6. DSC sealing, vacuum drying, and cover gas backfilling operations (using a mock-up DSC).
7. Opening a DSC (using a mock-up DSC).
8. Returning the DSC and TC to the spent fuel pool.

1.1.7 Special Requirements for First System in Place

The heat transfer characteristics of the cask system will be recorded by temperature measurements of the first DSC placed in service. The first DSC shall be loaded with assemblies,

constituting a source of approximately 24 kW in HSM (approximately 40.8 kW in HSM-H). The DSC shall be loaded into the HSM, and the thermal performance will be assessed by measuring the air inlet and outlet temperatures for normal airflow. Details for obtaining the measurements are provided in Section 1.2.8, under "Surveillance."

A letter report summarizing the results of the measurements shall be submitted to the NRC for evaluation and assessment of the heat removal characteristics of the cask in place within 30 days of placing the DSC in service, in accordance with 10 CFR 72.4.

Should the first user of the system not have fuel capable of producing a 24 kW heat load (40.8 kW heat load for 24PTH DSC), or be limited to a lesser heat load, as in the case of BWR fuel, the user may use a lesser load for the process, provided that a calculation of the temperature difference between the inlet and outlet temperatures is performed, using the same methodology and inputs documented in the FSAR, with lesser load as the only exception. The calculation and the measured temperature data shall be reported to the NRC in accordance with 10 CFR 72.4. The calculation and comparison need not be reported to the NRC for DSCs that are subsequently loaded with lesser loads than the initial case. However, for the first or any other user, the process needs to be performed and reported for any higher heat sources, up to 24 kW for PWR fuel stored in the 24P or 32PT or 24PHB or 24PTH-S-LC; up to 40.8 kW for PWR fuel stored in the 24PTH-S or 24PTH-L; 19 kW for BWR fuel stored in the 52B and 18.3 kW for BWR fuel stored in the 61BT, which are the maximum allowed under the Certificate of Compliance for these specific DSCs. The NRC will also accept the use of artificial thermal loads other than spent fuel, to satisfy the above requirement.

1.1.8 Surveillance Requirements Applicability

The specified frequency for each Surveillance Requirement is met if the surveillance is performed within 1.25 times the interval specified in the frequency, as measured from the previous performance.

For frequencies specified as "once," the above interval extension does not apply.

If a required action requires performance of a surveillance or its completion time requires period performance of "once per..." the above frequency extension applies to the repetitive portion, but not to the initial portion of the completion time.

Exceptions to these requirements are stated in the individual specifications.

1.1.9 Supplemental Shielding

Supplemental shielding and engineered features (e.g., earthen berms, shield walls) that are used to ensure compliance with 10 CFR 72.104(a) by each general licensee are to be considered important to safety and must be appropriately evaluated under 10 CFR 72.212(b).

1.1.10 HSM-H Storage Configuration

A minimum of two (2) HSM-Hs are required to be placed adjacent to each other for stability during design basis flood loads.

1.2 Technical Specifications, Functional and Operating Limits

1.2.1 Fuel Specifications

- Limit/Specification:** The characteristics of the spent fuel which is allowed to be stored in the standardized NUHOMS[®] system are limited by those included in Tables 1-1a, 1-1b, 1-1c, 1-1d, 1-1e, 1-1f, 1-1g, 1-1i, 1-1j, 1-1l, and 1-1m.
- Applicability:** The specification is applicable to all fuel to be stored in the standardized NUHOMS[®] system.
- Objective:** The specification is prepared to ensure that the peak fuel rod cladding temperatures, maximum surface doses, and nuclear criticality effective neutron multiplication factor are below the design limits. Furthermore, the fuel weight and type ensures that structural conditions in the FSAR bound those of the actual fuel being stored.
- Action:** Each spent fuel assembly to be loaded into a DSC shall have the parameters listed in Tables 1-1a, 1-1b, 1-1c, 1-1d, 1-1e, 1-1f, 1-1g, 1-1i, 1-1j, 1-1l, and 1-1m verified and documented. Fuel not meeting this specification shall not be stored in the standardized NUHOMS[®] system.
- Surveillance:** Prior to loading of a spent fuel assembly into a DSC, the identity of each fuel assembly shall be independently verified and documented.
- Bases:** The specification is based on consideration of the design basis parameters included in the FSAR and limitations imposed as a result of the staff review. Such parameters stem from the type of fuel analyzed, structural limitations, criteria for criticality safety, criteria for heat removal, and criteria for radiological protection. The standardized NUHOMS[®] system is designed for dry, horizontal storage of irradiated light water reactor (LWR) fuel. The principal design parameters of the fuel to be stored can accommodate standard PWR fuel designs manufactured by Babcock and Wilcox (B&W), Combustion Engineering (CE), and Westinghouse (WE), and standard BWR fuel manufactured by General Electric (GE) and Exxon/ANF. The NUHOMS[®]-24P and 52B systems are limited for use to these standard designs and to equivalent designs by other manufacturers as listed in Chapter 3 of the FSAR. The analyses presented in the FSAR are based on non-consolidated, zircaloy-clad fuel with no known or suspected gross breaches.
- The NUHOMS[®]-61BT, 32PT, 24PHB, and 24PTH systems are limited for use to these standard designs and to equivalent designs by other manufacturers as listed in Tables 1-1d, 1-1f, 1-1i, 1-1j, and 1-1m. The corresponding analyses for these systems are presented in Appendix K, M, N and P respectively of the FSAR.
- The physical parameters that define the mechanical and structural design of the HSM and DSC are the fuel assembly dimensions and weight. The

calculated stresses given in the FSAR are based on the physical parameters given in Tables 1-1a, 1-1b, 1-1c, 1-1d, 1-1e, 1-1f, 1-1g, 1-1i, 1-1j, 1-1l, and 1-1m which represent the upper bound.

The design basis fuel assemblies for nuclear criticality safety are Babcock and Wilcox 15x15 fuel assemblies for the NUHOMS[®]-24P and 24PHB, General Electric 7x7 fuel assemblies for the NUHOMS[®]-52B and General Electric 10x10 fuel assemblies for the NUHOMS[®]-61BT designs. The nuclear criticality safety for the NUHOMS[®]-32PT and NUHOMS[®]-24PTH designs is based on an evaluation of individual fuel assembly class as listed in Table 1-1e and Table 1-1l respectively.

The NUHOMS[®]-24P Long Cavity DSC is designed for use with standard Burnable Poison Rod Assembly (BPRA) designs for the B&W 15x15 and Westinghouse 17x17 fuel types as listed in Appendix J of the FSAR. The NUHOMS[®]-24PHB Long Cavity DSC is designed for use with standard BPRA designs for the B&W 15x15 fuel types listed in Appendix N of the FSAR.

The design basis PWR BPRA for shielding source terms and thermal decay heat load is the Westinghouse 17x17 Pyrex Burnable Absorber, while the DSC internal pressure analysis is limited by B&W 15x15 BPRAs. In addition, BPRAs with cladding failures were determined to be acceptable for loading into NUHOMS[®]-24P Long Cavity DSC as evaluated in Appendix J of the FSAR. The acceptability of loading BPRAs, including damaged BPRAs into the long cavity versions of the 32PT and 24PTH DSC configurations is provided in Appendix M and Appendix P respectively of the FSAR.

Control Components (CCs), as listed in Table 1-1l are authorized for storage in the NUHOMS[®]-24PTH DSC. The acceptability of loading CCs is provided in Appendix P of the FSAR.

The NUHOMS[®]-24P is designed for unirradiated fuel with an initial fuel enrichment of up to 4.0 wt. % U-235, taking credit for soluble boron in the DSC cavity water during loading operations. Section 1.2.15 defines the requirements for boron concentration in the DSC cavity water for the NUHOMS[®]-24P design only. In addition, the fuel assemblies qualified for storage in NUHOMS[®]-24P DSC have an equivalent unirradiated enrichment of less than or equal to 1.45 wt. % U-235. Figure 1-1 defines the required burnup as a function of initial enrichment. The NUHOMS[®]-52B is designed for unirradiated fuel with an initial enrichment of less than or equal to 4.0 wt. % U-235.

The NUHOMS[®]-61BT has three basket configurations, based on the boron content in the poison plates as listed in Table 1-1k. The maximum lattice average enrichment authorized for Type A, B and C NUHOMS[®]-61BT DSC is 3.7, 4.1 and 4.4 wt. % U-235 respectively.

The NUHOMS®-32PT is designed for unirradiated fuel with an initial fuel enrichment of up to 5.0 wt. % U-235 as shown in Table 1-1g, taking credit for Poison Rod Assemblies (PRAs), poison plates, and soluble boron in the DSC cavity water during loading operations. The required number of PRAs as a function of assembly class and maximum initial enrichment is per Table 1-1g. The required PRA locations are per Figures 1-5, or 1-6 or 1-7. *A 32PT DSC basket may contain 0, 4, 8 or 16 PRAs and is designated a Type A, Type B, Type C or Type D basket, respectively.* Table 1-1h specifies the minimum B10 content for poison plates. Specification 1.2.15a defines the requirements for boron concentration in the DSC cavity water for the NUHOMS®-32PT design only.

The NUHOMS®-24PHB is designed for unirradiated fuel with an assembly average initial enrichment of less than or equal to 4.5 wt. % U-235 as shown in Table 1-1i, taking credit for soluble boron in the DSC cavity water during loading operations. Specification 1.2.15b defines the requirements for boron concentration in the DSC cavity water for the NUHOMS®-24PHB design only.

The NUHOMS®-24PTH is designed for unirradiated fuel with an assembly average initial enrichment of less than or equal to 5.0 wt. % U-235, as shown in Table 1-1l, taking credit for soluble boron in the DSC cavity water during loading operations and the boron content in the poison plates of the DSC basket, as shown in Table 1-1p for intact fuel and Table 1-1q for damaged fuel. The 24PTH DSC basket is designated as Type 1, if it is provided with aluminum inserts and Type 2 if it does not contain the aluminum inserts. Each basket type is designed with three alternate configurations, based on the boron content in the poison plates, as listed in Table 1-1r. Specification 1.2.15c defines the requirements for boron concentration in the DSC cavity water as a function of the DSC basket type for the various fuel classes authorized for storage in the 24PTH DSC for the NUHOMS®-24PTH design only.

The thermal design criterion of the fuel to be stored is that the total maximum heat generation rate per assembly and BPRA or Control Components be such that the fuel cladding temperature is maintained within established limits during normal and off-normal conditions. For the NUHOMS®-24P, 52B and 61BT systems, fuel cladding temperature limits were established based on methodology in PNL-6189 and PNL-4835. For the NUHOMS®-32PT, 24PHB and 24PTH systems, fuel cladding limits are based on ISG-11, Rev. 2 (Reference 3).

The radiological design criterion is that fuel stored in the NUHOMS® system must not increase the average calculated HSM or transfer cask surface dose rates beyond those calculated for the 24P, 24PHB, 52B, 61BT, or 32PT canister full of design basis fuel assemblies with or without BPRAs. The design value average HSM and cask surface dose rates for the 24P and 52B canisters were calculated to be 48.6 mrem/hr

and 591.8 mrem/hr respectively based on storing twenty four (24) Babcock and Wilcox 15x15 PWR assemblies (without BPRAs) with 4.0 wt. % U-235 initial enrichment, irradiated to 40,000 MWd/MTU, and having a post irradiation time of five years. To account for BPRAs, the fuel assembly cooling required times are increased to maintain the above dose rate limits.

Table 1-1a
PWR Fuel Specifications for Fuel to be Stored in the
Standardized NUHOMS®-24P DSC

Title or Parameter	Specifications
Fuel	Only intact, unconsolidated PWR fuel assemblies (with or without BPRAs) with the following requirements.
Physical Parameters (without BPRAs)	
Maximum Assembly Length (unirradiated)	165.75 in (standard cavity) 171.71 in (long cavity)
Nominal Cross-Sectional Envelope	8.536 in
Maximum Assembly Weight	1682 lbs
No. of Assemblies per DSC	≤ 24 intact assemblies
Fuel Cladding	Zircalloy-clad fuel with no known or suspected gross cladding breaches
Physical Parameters (with BPRAs)	
Maximum Assembly + BPRA Length (unirradiated)	
With Burnup > 32,000 and ≤ 45,000 MWd/MTU	171.71 in (long cavity)
With Burnup ≤ 32,000 MWd/MTU	171.96 in (long cavity)
Nominal Cross-Sectional Envelope	8.536 in
Maximum Assembly + BPRA Weight	1682 lbs
No. of Assemblies per DSC	≤ 24 intact assemblies
No. of BPRAs per DSC	≤ 24 BPRAs
Fuel Cladding	Zircalloy-clad fuel with no known or suspected gross cladding breaches
Nuclear Parameters	
Fuel Initial Enrichment	≤ 4.0 wt. % U-235
Fuel Burnup and Cooling Time	Per Table 1-2a (without BPRAs) or Per Table 1-2c (with BPRAs)
BPRA Cooling Time (Minimum)	5 years for B&W Designs 10 years for Westinghouse Designs
Alternate Nuclear Parameters	
Initial Enrichment	≤ 4.0 wt. % U-235
Burnup	≤ 40,000 MWd/MTU
Decay Heat (Fuel + BPRA)	≤ 1.0 kW per assembly
Neutron Fuel Source	≤ 2.23×10^8 n/sec per assy with spectrum bounded by that in Chapter 7 of FSAR
Gamma (Fuel + BPRA) Source	≤ 7.45×10^{15} g/sec per assy with spectrum bounded by that in Chapter 7 of FSAR

Table 1-1b
BWR Fuel Specifications for Fuel to be Stored in the
Standardized NUHOMS®-52B DSC

Title or Parameter	Specifications
Fuel	Only intact, unconsolidated BWR fuel assemblies with the following requirements
Physical Parameters	
Maximum Assembly Length (unirradiated)	176.16 in
Nominal Cross-Sectional Envelope*	5.454 in
Maximum Assembly Weight	725 lbs
No. of Assemblies per DSC	≤ 52 intact channeled assemblies
Fuel Cladding	Zircalloy-clad fuel with no known or suspected gross cladding breaches
Nuclear Parameters	
Fuel Initial Lattice Enrichment	≤ 4.0 wt. % U-235
Fuel Burnup and Cooling Time	Per Table 1-2b
Alternate Nuclear Parameters	
Initial Enrichment	≤ 4.0 wt. % U-235
Burnup	≤ 35,000 MWd/MTU and per Figure 1.1
Decay Heat	≤ 0.37 kW per assembly
Neutron Source	≤ 1.01×10^8 n/sec per assy with spectrum bounded by that in Chapter 7 of FSAR
Gamma Source	≤ 2.63×10^{15} g/sec per assy with spectrum bounded by that in Chapter 7 of FSAR

*Cross-Sectional Envelope is the outside dimension of the fuel channel.

Table 1-1c
BWR Fuel Specifications for Fuel to be Stored in the
Standardized NUHOMS® -61BT DSC

Physical Parameters	
Fuel Design	7x7, 8x8, 9x9, or 10x10 BWR fuel assemblies manufactured by General Electric or equivalent reload fuel that are enveloped by the fuel assembly design characteristics listed in Table 1-1d.
Cladding Material	Zircaloy
Fuel Damage	Cladding damage in excess of pinhole leaks or hairline cracks is not authorized to be stored as "Intact BWR Fuel."
Channels	Fuel may be stored with or without fuel channels
Maximum Assembly Length	176.2 in
Nominal Assembly Width (excluding channels)	5.44 in
Maximum Assembly Weight	705 lbs
Radiological Parameters: No interpolation of Radiological Parameters is permitted between Groups.	
Group 1	
Maximum Burnup	27,000 MWd/MTU
Minimum Cooling Time	5-years
Maximum Lattice Average Initial Enrichment	See Minimum Boron Loading below.
Minimum Initial Bundle Average Enrichment	2.0 wt. % U-235
Maximum Initial Uranium Content	198 kg/assembly
Maximum Decay Heat	300 W/assembly
Group 2	
Maximum Burnup	35,000 MWd/MTU
Minimum Cooling Time	8-years
Maximum Lattice Average Initial Enrichment	See Minimum Boron Loading below.
Minimum Initial Bundle Average Enrichment	2.65 wt. % U-235
Maximum Initial Uranium Content	198 kg/assembly
Maximum Decay Heat	300 W/assembly
Group 3	
Maximum Burnup	37,200 MWd/MTU
Minimum Cooling Time	6.5-years
Maximum Lattice Average Initial Enrichment	See Minimum Boron Loading below.
Minimum Initial Bundle Average Enrichment	3.38 wt. % U-235
Maximum Initial Uranium Content	198 kg/assembly
Maximum Decay Heat	300 W/assembly
Group 4	
Maximum Burnup	40,000 MWd/MTU
Minimum Cooling Time	10-years
Maximum Lattice Average Initial Enrichment	See Minimum Boron Loading below.
Minimum Initial Bundle Average Enrichment	3.4 wt. % U-235
Maximum Initial Uranium Content	198 kg/assembly
Maximum Decay Heat	300 W/assembly
Minimum Boron Loading	
Lattice Average Enrichment (wt. % U-235)	Minimum B-10 Content in Poison Plates
4.4	Type C Basket
4.1	Type B Basket
3.7	Type A Basket
Alternate Radiological Parameters:	
Maximum Initial Enrichment:	See Minimum Boron Loading Above
Fuel Burnup, Initial Bundle Average Enrichment, and Cooling Time:	See Table 1-2q
Maximum Initial Uranium Content:	198 kg/assembly
Maximum Decay Heat:	300 W/assembly

Table 1-1d
BWR Fuel Assembly Design Characteristics ^{(1) (2) (3)}
for the NUHOMS[®]-61BT DSC

Transnuclear, ID	7 x 7- 49/0 ⁽⁵⁾	8 x 8- 63/1 ⁽⁵⁾	8 x 8- 62/2 ⁽⁵⁾	8 x 8- 60/4 ⁽⁵⁾	8 x 8- 60/1 ⁽⁵⁾	9 x 9- 74/2	10x10- 92/2	7x7- 49/0 ⁽⁵⁾	7x7 48/1Z ⁽⁵⁾	8x8 - 60/4Z ⁽⁵⁾
GE Designations	GE1	GE4	GE-5 GE-Pres GE-Barrier GE8 Type I	GE8 Type II	GE9 GE10	GE11 GE13	GE12	ENC III-A	ENC III ⁽³⁾	ENC Va & ENC Vb
	GE2									
	GE3									
Max Length (in) (Unirradiated)	176.2	176.2	176.2	176.2	176.2	176.2	176.2	176.2	176.2	176.2
Nominal Width (in) (excluding channels)	5.44	5.44	5.44	5.44	5.44	5.44	5.44	5.44	5.44	5.44
Fissile Material	UO ₂	UO ₂	UO ₂	UO ₂	UO ₂	UO ₂	UO ₂	UO ₂	UO ₂	UO ₂
Number of Fuel Rods	49	63	62	60	60	66 – Full 8 – Partial	78 – Full 14 – Partial	49	48	60
Number of Water Holes	0	1	2	4	1	2	2	0	1 ⁽⁴⁾	4 ⁽⁴⁾

- (1) Any fuel channel thickness from 0.065 to 0.120 inch is acceptable on any of the fuel designs.
(2) Maximum fuel assembly weight with channel is 705 lb.
(3) Includes ENC III-E and ENC III-F.
(4) Solid Zirc rods instead of water holes.
(5) May be stored as damaged fuel.

Table 1-1e
PWR Fuel Specifications for Fuel to be Stored in the NUHOMS®-32PT DSC

<u>PHYSICAL PARAMETERS:</u>	
Fuel Assembly Class	<i>Only intact (including reconstituted) B&W 15x15, WE 17x17, CE 15x15, WE 15x15, CE 14x14 and WE 14x14 class PWR assemblies or equivalent reload fuel manufactured by other vendors that are enveloped by the fuel assembly design characteristics listed in Table 1-1f.</i>
<i>Reconstituted Fuel Assemblies</i>	<i>≤ 32 assemblies per DSC with up to 56 stainless steel rods per assembly or unlimited number of lower enrichment UO₂ rods per assembly.</i>
Fuel Cladding Material	Zircaloy
Fuel Damage	Cladding damage in excess of pinhole leaks or hairline cracks is not authorized to be stored as "Intact PWR Fuel."
Burnable Poison Rod Assemblies (BPRAs)	Standard BPRA designs for the B&W 15x15 and Westinghouse 17x17 class assemblies as listed in Appendix J of the FSAR.
Maximum Assembly plus BPRA Weight	-1365 lbs for 32PT-S100 & 32PT-L100 System -1682 lbs for 32PT-S125 & 32PT-L125 System
BPRA Damage	BPRAs with cladding failures are acceptable for loading.
<u>THERMAL/RADIOLOGICAL PARAMETERS:</u>	
Fuel Burnup and Cooling Time without BPRAs	Per Table 1-2d, Table 1-2e, Table 1-2f, Table 1-2g, Table 1-2h, and Figure 1-2 or Figure 1-3 or Figure 1-4.
Fuel Burnup and Cooling Time with BPRAs	Per Table 1-2i, Table 1-2j, Table 1-2k, Table 1-2l, Table 1-2m and Figure 1-2 or Figure 1-3 or Figure 1-4.
Initial Enrichment	Per Table 1-1g and Figure 1-5 or Figure 1-6 or Figure 1-7.
B&W 15x15 BPRA Burnup and Cooling Time	BPRA Burnup shall not exceed that of a BPRA irradiated in fuel assemblies with a total Burnup of 36,000 MWd/MTU. -Minimum Cooling Time 5 years
WE 17x17 BPRA Burnup and Cooling Time	BPRA Burnup shall not exceed that of a BPRA irradiated in fuel assemblies with a total Burnup of 36,000 MWd/MTU. -Minimum Cooling Time 10 years

Table 1-1f
PWR Fuel Assembly Design Characteristics for the NUHOMS®-32PT DSC

Assembly Class	B&W 15x15	WE 17x17	CE 15x15 ⁽³⁾	WE 15x15	CE 14x14	WE 14x14
DSC Configuration	Max Unirradiated Length (in)					
32PT-S100/32PT-S125	165.75	165.75	165.75	165.75	165.75	165.75
32PT-L100/32PT-L125	171.71 ⁽¹⁾	171.71 ⁽¹⁾	171.71	171.71	171.71	171.71
Fissile Material	UO ₂	UO ₂	UO ₂	UO ₂	UO ₂	UO ₂
Maximum MTU/assembly ⁽²⁾	0.475	0.475	0.475	0.475	0.475	0.475
Maximum Number of Fuel Rods	208	264	216	204	176	179
Maximum Number of Guide/ Instrument Tubes	17	25	9	21	5	17

⁽¹⁾ Maximum Assembly + BPRA Length (unirradiated)

⁽²⁾ The maximum MTU/assembly is based on the shielding analysis. The listed value is higher than the actual.

⁽³⁾ CE 15x15 assemblies with stainless steel plugging clusters installed are acceptable.

Table 1-1g
Initial Enrichment, Required Number of PRAs and Minimum Soluble Boron Loading
(NUHOMS®-32PT DSC)

Assembly Class and Type	Minimum Soluble Boron Loading (ppm)	Initial Enrichment, wt % U-235			
		0 PRA (Type A Basket)	4 PRAs (Type B Basket)	8 PRAs (Type C Basket)	16 PRAs (Type D Basket)
WE 17x17 Fuel Assembly ⁽¹⁾ Westinghouse 17x17 LOPAR/Standard Westinghouse 17x17 OFA/Vantage 5, + ⁽²⁾	2500	3.40	4.00	4.50	5.00
B&W 15x15 Mark B Fuel Assembly ⁽¹⁾	2500	3.30	3.90	NE	5.00
WE 15x15 Fuel Assembly Westinghouse 15x15 Standard/ZC Exxon/ANF 15x15 WE	2500	3.40	4.00	4.60	5.00
CE 14x14 Fuel Assembly CE 14x14 Standard/Generic CE 14x14 Fort Calhoun	1800	3.35	3.90	4.35	NE
	2000	3.50	4.10	4.55	NE
	2100	3.60	4.20	4.70	NE
	2200	3.70	4.30	4.80	NE
	2300	3.75	4.40	4.90	NE
	2400	3.80	4.50	5.00	NE
	2500	3.90	4.55	-	NE
WE 14x14 Fuel Assembly Westinghouse 14x14 ZCA/ZCB Westinghouse 14x14 OFA Exxon/ANF 14x14 WE	1800	3.55	4.25	NE	NE
	2000	3.75	4.50	NE	NE
	2100	3.80	4.60	NE	NE
	2200	3.90	4.70	NE	NE
	2300	4.00	4.85	NE	NE
	2400	4.10	4.95	NE	NE
	2500	4.15	5.00	NE	NE
CE 15x15 Fuel Assembly CE 15x15 Palisades Exxon/ANF 15x15 CE	1800	3.00	NE	NE	NE
	2000	3.15	NE	NE	NE
	2100	3.20	NE	NE	NE
	2200	3.30	NE	NE	NE
	2300	3.35	NE	NE	NE
	2400	3.40	NE	NE	NE
	2500	3.50	NE	NE	NE

NOTES:

(1) With or without BPRAs. BPRAs shall not be stored in basket location where a PRA is required.

(2) Includes all Vantage versions (5, +, ++, etc.)

NE = Not Evaluated

Table 1-1h
B10 Content Specification for Poison Plates (NUHOMS®-32PT DSC)

DSC Configuration	Poison Plate Specification
32PT-S100 or 32PT-S125 or 32PT-L100 or 32PT-L125	Minimum B10 areal density = 0.007 gm/cm ²

Table 1-1i
PWR Fuel Specifications for Fuel to be Stored in the
Standardized NUHOMS®-24PHB DSC

Title or Parameter	Specifications
<p>Fuel</p> <p>Only intact, unconsolidated B&W 15x15 (<i>with or without BPRAs</i>), WE 17x17, WE 15x15, CE 14x14, and WE 14x14 (<i>all without BPRAs</i>) Class PWR fuel assemblies or equivalent reload fuel manufactured by other vendor, with the following requirements:</p> <p>Maximum No. of Reconstituted Assemblies per DSC with Stainless Steel rods 4.</p> <p>Maximum No. of Stainless Steel Rods per Reconstituted Assembly 10</p> <p>Maximum No. of Reconstituted Assemblies per DSC with low enriched uranium oxide rods 24</p>	
<p>Physical Parameters (without BPRAs)</p> <p>Maximum Assembly Length (unirradiated) 165.785 in (standard cavity) 171.96 in (long cavity)</p> <p>Nominal Cross-Sectional Envelope 8.536 in</p> <p>Maximum Assembly Weight 1682 lbs</p> <p>No. of Assemblies per DSC ≤ 24 intact assemblies</p> <p>Fuel Cladding Zircaloy-clad fuel with no known or suspected gross cladding breaches</p>	
<p>Physical Parameters (with BPRAs)</p> <p>Maximum Assembly + BPRA Length (unirradiated) 171.96 in (long cavity)</p> <p>Nominal Cross-Sectional Envelope 8.536 in</p> <p>Maximum Assembly + BPRA Weight 1682 lbs</p> <p>No. of Assemblies per DSC ≤ 24 intact assemblies</p> <p>No. of BPRAs per DSC ≤ 24 BPRAs</p> <p>Fuel Cladding Zircaloy-clad fuel with no known or suspected gross cladding breaches</p>	
<p>Nuclear Parameters</p> <p>Maximum Fuel Initial Enrichment 4.5 wt. % U-235</p> <p>Maximum Initial Uranium loading per assembly 0.490 MTU</p> <p>Allowable loading configurations for each 24PHB DSC As specified in Figure 1-8 or 1-9</p> <p>Burnup, Enrichment, and Minimum Cooling Time for Configuration 1 (Figure 1-8) Table 1-2n for Zone 1 fuel; Table 1-2o for Zone 2 fuel; Table 1-2p for Zone 3 fuel</p> <p>Burnup, Enrichment, and Minimum Cooling Time for Configuration 2 (Figure 1-9) Table 1-2p for Zone 3 fuel</p> <p>Minimum Cooling Time for BPRAs 5 years</p> <p>Total Decay Heat per DSC 24 kW</p> <p>Decay Heat Limits for Zone 1, 2 and 3 fuel As specified in Figures 1-8 and 1-9.</p>	

Table 1-1j
BWR Fuel Specification of Damaged Fuel to be Stored in the Standardized
NUHOMS®-61BT DSC

PHYSICAL PARAMETERS:	
Fuel Design:	7x7, 8x8 BWR damaged fuel assemblies manufactured by General Electric or Exxon/ANF or equivalent reload fuel that are enveloped by the Fuel assembly design characteristics listed in Table 1-1d for the 7x7 and 8x8 designs only.
Cladding Material:	Zircaloy
Fuel Damage:	Damaged BWR fuel assemblies are fuel assemblies containing fuel rods with known or suspected cladding defects greater than hairline cracks or pinhole leaks. Missing cladding and/or crack size in the fuel pins is to be limited such that a fuel pellet is not able to pass through the gap created by the cladding opening during handling and retrievability is assured following Normal/Off-Normal conditions. Damaged fuel shall be stored with Top and Bottom Caps for Failed Fuel. Damaged fuel may only be stored in the 2x2 compartments of the "Type C" NUHOMS®-61BT Canister.
Channels:	Fuel may be stored with or without fuel channels.
Maximum Assembly Length (unirradiated)	176.2 in
Nominal Assembly Width (excluding channels)	5.44 in
Maximum Assembly Weight	705 lbs
RADIOLOGICAL PARAMETERS:	No interpolation of Radiological Parameters is permitted between groups.
Group 1:	
Maximum Burnup:	27,000 MWd/MTU
Minimum Cooling Time:	5-years
Maximum Initial Lattice Average Enrichment:	4.0 wt. % U-235
Maximum Pellet Enrichment:	4.4 wt. % U-235
Minimum Initial Bundle Average Enrichment:	2.0 wt. % U-235
Maximum Initial Uranium Content:	198 kg/assembly
Maximum Decay Heat:	300 W/assembly
Group 2:	
Maximum Burnup:	35,000 MWd/MTU
Minimum Cooling Time:	8-years
Maximum Initial Lattice Average Enrichment:	4.0 wt. % U-235
Maximum Pellet Enrichment:	4.4 wt. % U-235
Minimum Initial Bundle Average Enrichment:	2.65 wt. % U-235
Maximum Initial Uranium Content:	198 kg/assembly
Maximum Decay Heat:	300 W/assembly
Group 3:	
Maximum Burnup:	37,200 MWd/MTU
Minimum Cooling Time:	6.5-years
Maximum Initial Lattice Average Enrichment:	4.0 wt. % U-235
Maximum Pellet Enrichment:	4.4 wt. % U-235
Minimum Initial Bundle Average Enrichment:	3.38 wt. % U-235
Maximum Initial Uranium Content:	198 kg/assembly
Maximum Decay Heat:	300 W/assembly

Table 1-1j
BWR Fuel Specification of Damaged Fuel to be Stored in the Standardized
NUHOMS® -61BT DSC

(Concluded)

RADIOLOGICAL PARAMETERS:	
Group 4:	
Maximum Burnup:	40,000 MWd/MTU
Minimum Cooling Time:	10-years
Maximum Initial Lattice Average Enrichment:	4.0 wt. % U-235
Maximum Pellet Enrichment:	4.4 wt. % U-235
Minimum Initial Bundle Average Enrichment:	3.4 wt. % U-235
Maximum Initial Uranium Content:	198 kg/assembly
Maximum Decay Heat:	300 W/assembly
ALTERNATE RADIOLOGICAL PARAMETERS:	
Maximum Initial Lattice Average Enrichment:	4.0 wt. % U-235
Fuel Burnup, Initial Bundle Average Enrichment, and Cooling Time:	See Table 1-2q
Maximum Pellet Enrichment:	4.4 wt. % U-235
Maximum Initial Uranium Content:	198 kg/assembly
Maximum Decay Heat:	300 W/assembly

Table 1-1k
B10 Specification for the NUHOMS®-61BT Poison Plates

NUHOMS®-61BT DSC Basket Type	Minimum B10 Aerial Density, gm/cm ²	
	Enriched Boron Aluminum Alloy or Boralyn®(1)	Boral® or Metamic®(2)
A	.021	.025
B	.032	.038
C	.040	.048

Note 1: An alternate metal matrix composite with properties equivalent to Boralyn® is acceptable.

Note 2: An alternate metal matrix composite with properties equivalent to Metamic® is acceptable.

Table 1-11
PWR Fuel Specification for the Fuel to be Stored in the NUHOMS®-24PTH DSC

<u>PHYSICAL PARAMETERS:</u>	
Fuel Class	Intact or damaged unconsolidated B&W 15x15, WE 17x17, CE 15x15, WE 15x15, CE 14x14 and WE 14x14 class PWR assemblies (with or without control components) that are enveloped by the fuel assembly design characteristics listed in Table 1-1m. Equivalent reload fuel manufactured by other vendors but enveloped by the design characteristics listed in Table 1-1m is also acceptable.
Fuel Damage	Damaged PWR fuel assemblies are assemblies containing missing or partial fuel rods or fuel rods with known or suspected cladding defects greater than hairline cracks or pinhole leaks. The extent of cladding damage in the fuel rods is to be limited such that a fuel pellet is not able to pass through the damaged cladding opening during handling and retrievability is assured following normal and off-normal conditions.
Reconstituted Fuel Assemblies: <ul style="list-style-type: none"> • Maximum No. of Reconstituted Assemblies per DSC With Stainless Steel Rods • Maximum No. of Stainless Steel Rods per Reconstituted Fuel Assembly • Maximum No. of Reconstituted Assemblies per DSC with low enriched UO2 rods 	<p align="center">4</p> <p align="center">10</p> <p align="center">24</p>
Control Components (CCs)	<ul style="list-style-type: none"> • Up to 24 CCs are authorized for storage in 24PTH-L and 24PTH-S-LC DSCs only. • Authorized CCs include Burnable Poison Rod Assemblies (BPRAs), Thimble Plug Assemblies (TPAs), Control Rod Assemblies (CRAs), Axial Power Shaping Assembly Rods (APSRAs), Orifice Rod Assemblies (ORAs) and Neutron Source Assemblies (NSAs). • Design basis thermal and radiological characteristics for the CCs are listed in Table 1-1n.
Nominal Assembly Width	8.536 inches
No. of Intact Assemblies	≤24
No. and Location of Damaged Assemblies	<p>Maximum of 12 damaged fuel assemblies. Balance may be intact fuel assemblies, empty slots, or dummy assemblies depending on the specific heat load zoning configuration.</p> <p>Damaged fuel assemblies are to be placed in Location A and/or B as shown in Figure 1-16. The DSC basket cells which store damaged fuel assemblies are provided with top and bottom end caps to assure retrievability.</p>
Maximum Assembly plus CC Weight	1682 lbs

Table 1-11
PWR Fuel Specification for the Fuel to be Stored in the NUHOMS®-24PTH DSC
(Concluded)

<p><u>THERMAL/RADIOLOGICAL PARAMETERS:</u></p> <p>Allowable Heat Load Zoning Configurations for each 24PTH DSC</p> <p>Burnup, Enrichment, and Minimum Cooling Time for Configuration 1 (Without CCs)</p> <p>Burnup, Enrichment, and Minimum Cooling Time for Configuration 2 (Without CCs)</p> <p>Burnup, Enrichment, and Minimum Cooling Time for Configuration 3 (Without CCs)</p> <p>Burnup, Enrichment, and Minimum Cooling Time for Configuration 4 (Without CCs)</p> <p>Burnup, Enrichment, and Minimum Cooling Time for Configuration 5 (Without CCs)</p> <p>Burnup, Enrichment, and Minimum Cooling Time for Configuration 1 (With CCs)</p> <p>Burnup, Enrichment, and Minimum Cooling Time for Configuration 2 (With CCs)</p> <p>Burnup, Enrichment, and Minimum Cooling Time for Configuration 3 (With CCs)</p> <p>Burnup, Enrichment, and Minimum Cooling Time for Configuration 4 (With CCs)</p> <p>Burnup, Enrichment, and Minimum Cooling Time for Configuration 5 (With CCs)</p>	<p>Per Figure 1-11 or Figure 1-12 or Figure 1-13 or Figure 1-14 or Figure 1-15.</p> <p>Per Table 1-3a for Zone 1 fuel.</p> <p>Per Table 1-3b for Zone 2 fuel.</p> <p>Per Table 1-3b for Zone 2 fuel and Table 1-3c for Zone 3 fuel.</p> <p>Per Table 1-3d for Zone 4 fuel.</p> <p>Per Table 1-3c for Zone 3 fuel and Table 1-3d for Zone 4 fuel.</p> <p>Per Table 1-3e for Zone 1 fuel.</p> <p>Per Table 1-3f for Zone 2 fuel.</p> <p>Per Table 1-3f for Zone 2 fuel and per Table 1-3g for Zone 3 fuel.</p> <p>Per Table 1-3h for Zone 4 fuel.</p> <p>Per Table 1-3g for Zone 3 fuel and per Table 1-3h for Zone 4 fuel.</p>
<p>Maximum Initial Fuel Enrichment</p>	<p>5.0 wt. % U-235</p>
<p>Maximum Decay Heat Limits for Zones 1, 2, 3, and 4 Fuel</p>	<p>Per Figure 1-11 or Figure 1-12 or Figure 1-13 or Figure 1-14 or Figure 1-15.</p>
<p>Decay Heat per DSC</p>	<p>≤ 40.8 kW for 24PTH-S and 24PTH-L DSCs (Type 1 Basket)</p>
	<p>≤ 31.2 kW for 24PTH-S and 24PTH-L DSCs (Type 2 Basket)</p>
	<p>≤ 24.0 kW for 24PTH-S-L DSC (Type 2 Basket)</p>
<p>Minimum Boron Loading in the Poison Plates</p>	<p>Per Table 1-1r</p>

Table 1-1m
PWR Fuel Assembly Design Characteristics for the NUHOMS®-24PTH DSC

Assembly Class		B&W 15x15	WE 17x17	CE 15x15	WE 15x15	CE 14x14	WE 14x14
Maximum Unirradiated Length (in) ⁽¹⁾	24PTH-S	165.75	165.75	165.75	165.75	165.75	165.75
	24PTH-L	171.93	171.93	171.93	171.93	171.93	171.93
	24PTH-S-LC	171.93	N/A ⁽³⁾	N/A ⁽³⁾	N/A ⁽³⁾	N/A ⁽³⁾	N/A ⁽³⁾
Fissile Material		UO ₂	UO ₂	UO ₂	UO ₂	UO ₂	UO ₂
Maximum MTU/Assembly ⁽²⁾		0.49	0.49	0.49	0.49	0.49	0.49
Maximum Number of Fuel Rods		208	264	216	204	176	179
Maximum Number of Guide/ Instrument Tubes		17	25	9	21	5	17

(1) Maximum Assembly + Control Component Length (unirradiated)

(2) The maximum MTU/assembly is based on the shielding analysis. The listed value is higher than the actual.

(3) Not authorized for storage.

Table 1-1n
Thermal and Radiological Characteristics for Control Components Stored in the
NUHOMS® -24PTH DSC

Parameter	BPRAs, NSAs, CRAs and APSRAs	TPAs and ORAs
Maximum Gamma Source (γ /sec/DSC)	9.3E+14	9.8E+13
Decay Heat (Watts/DSC)	192.0	192.0

Table 1-1p
Maximum Assembly Average Initial Enrichment v/s Neutron Poison Requirements for the
NUHOMS® -24PTH DSC (Intact Fuel)

Fuel Assembly Class	Maximum Assembly Average Initial Enrichment (wt. % U-235) as a Function of Soluble Boron Concentration and Basket Type (Fixed Poison Loading)			
	Minimum Soluble Boron (ppm)	Basket Type		
		1A or 2A	1B or 2B	1C or 2C
CE 14x14 ⁽¹⁾	2100	4.50	4.90	NR
	2200	4.60	5.00	NR
	2300	4.70	NR	NR
	2400	4.80	NR	NR
	2500	4.90	NR	NR
	2600	5.00	NR	NR
WE 14x14 ⁽²⁾	2100	4.80	5.00	NR
	2200	4.90	NR	NR
	2300	5.00	NR	NR
CE 15x15 ⁽²⁾	2100	3.90	4.20	4.60
	2200	4.00	4.40	4.70
	2300	4.10	4.50	4.80
	2400	4.20	4.60	4.90
	2500	4.30	4.70	5.00
	2600	4.40	4.80	NR
	2700	4.50	4.90	NR
	2800	4.50	5.00	NR
	2900	4.60	NR	NR
	3000	4.70	NR	NR
WE 15x15 ⁽²⁾	2100	3.80	4.20	4.60
	2200	3.90	4.30	4.70
	2300	4.00	4.40	4.80
	2400	4.10	4.50	4.90
	2500	4.20	4.60	5.00
	2600	4.30	4.70	NR
	2700	4.30	4.80	NR
	2800	4.40	4.90	NR
	2900	4.50	5.00	NR
	3000	4.60	NR	NR

Table 1-1p
Maximum Assembly Average Initial Enrichment v/s Neutron Poison Requirements for the
NUHOMS® -24PTH DSC (Intact Fuel)
(Concluded)

Fuel Assembly Class	Maximum Assembly Average Initial Enrichment (wt. % U-235) as a Function of Soluble Boron Concentration and Basket Type (Fixed Poison Loading)			
	Minimum Soluble Boron (ppm)	Basket Type		
		1A or 2A	1B or 2B	1C or 2C
WE 17x17 ⁽²⁾	2100	3.80	4.10	4.50
	2200	3.90	4.20	4.60
	2300	4.00	4.30	4.70
	2400	4.00	4.40	4.80
	2500	4.10	4.50	4.90
	2600	4.20	4.60	5.00
	2700	4.30	4.70	NR
	2800	4.40	4.80	NR
	2900	4.50	4.90	NR
	3000	4.60	5.00	NR
B&W 15x15 ⁽²⁾	2100	3.60	4.00	4.30
	2200	3.70	4.10	4.50
	2300	3.80	4.20	4.60
	2400	3.90	4.30	4.70
	2500	4.00	4.40	4.80
	2600	4.10	4.50	4.90
	2700	4.20	4.60	5.00
	2800	4.20	4.70	NR
	2900	4.30	4.80	NR
	3000	4.40	4.90	NR

Notes:

- (1) When CCs that extend into the active fuel region are stored, the maximum assembly average initial enrichment shall be reduced by 0.2 wt. %.
- (2) When CCs that extend into the active fuel region are stored, the maximum assembly average initial enrichment shall be reduced by 0.05 wt. % or the soluble boron concentration shall increased by 50 ppm.

Note: NR = Not Required.

Table 1-1q
Maximum Assembly Average Initial Enrichment v/s Neutron Poison Requirements for the
NUHOMS® -24PTH DSC (Damaged Fuel)

Assembly Class	Maximum Number of Damaged Fuel Assemblies per DSC	Maximum Assembly Average Initial Enrichment (wt. % U-235) as a Function of Soluble Boron Concentration and Basket Type (Fixed Poison Loading)			
		Minimum Soluble Boron (ppm)	Basket Type		
			1A or 2A	1B or 2B	1C or 2C
CE 14x14 ⁽¹⁾	8	2150	NR	4.80	NR
	12	2150	NR	4.70	NR
	12	2450	4.50	5.00	NR
WE 14x14 ⁽²⁾	12	2150	4.50	5.00	NR
CE 15x15 ⁽²⁾	12	2150	NR	NR	4.50
	12	2550	NR	NR	5.00
WE 15x15 ⁽²⁾	8	2150	NR	NR	4.50
	12	2250	NR	NR	4.50
	8	2550	NR	NR	5.00
	12	2650	NR	NR	5.00
B&W 15x15 ⁽²⁾	12	2350	NR	NR	4.50
	12	2800	NR	NR	5.00
WE 17x17 ⁽²⁾	12	2250	NR	NR	4.50
	12	2650	NR	NR	5.00

Notes:

- (1) When CCs that extend into the active fuel region are stored, the maximum assembly average initial enrichment shall be reduced by 0.2 wt. %.
- (2) When CCs that extend into the active fuel region are stored, the maximum assembly average initial enrichment shall be reduced by 0.05 wt. % or the soluble boron concentration shall increased by 50 ppm.

Note: NR = Not Required.

Table 1-1r
B10 Specification for the NUHOMS®-24PTH Poison Plates

NUHOMS®-24PTH DSC Basket Type ⁽¹⁾	Minimum B10 Aerial Density, gm/cm ²	
	Natural or Enriched Boron Aluminum Alloy / Metal Matrix Composite (MMC)	Boral®
1A or 2A	.007	.009
1B or 2B	.015	.019
1C or 2C	.032	.040

(1) Basket Type 1 contains aluminum inserts in the R45 transition rails of the basket, Type 2 does not contain aluminum inserts.

Table 1-2a
PWR Fuel Qualification Table for the Standardized NUHOMS®-24P DSC (Fuel Without BPRAs)
 (Minimum required years of cooling time after reactor core discharge)

Burnup (Gwd/ MTU)	Initial Enrichment (wt. % U-235)																				
	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0
10	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
15	5	5	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
20	5	5	5	5	5	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
25		5	5	5	5	5	5	5	5	a	a	a	a	a	a	a	a	a	a	a	a
28				5	5	5	5	5	5	5	5	5	a	a	a	a	a	a	a	a	a
30						5	5	5	5	5	5	5	5	a	a	a	a	a	a	a	a
32							5	5	5	5	5	5	5	5	5	a	a	a	a	a	a
34								6	5	5	5	5	5	5	5	5	5	a	a	a	a
36									6	6	6	6	5	5	5	5	5	5	5	a	a
38											7	6	6	6	6	6	6	6	5	5	5
40				Not Acceptable or Not Analyzed								8	8	8	7	6	6	6	6	6	6
41												9	9	9	8	8	8	8	8	8	8
42													10	9	9	9	9	9	9	8	8
43														10	10	10	10	10	9	9	9
44															11	11	11	11	10	10	10
45																12	12	11	11	11	11

a) Minimum Cooling Time 5 years, and Minimum 2350 ppm soluble boron required in the DSC cavity water during loading or unloading.

Notes:

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 2.0 wt. % U-235 must be qualified for storage using the alternate nuclear parameters specified in Table 1-1a. Fuel with an initial enrichment greater than 4.0 wt. % U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 Gwd/MTU is unacceptable for storage.
- Example: An assembly with an initial enrichment of 3.65 wt. % U-235 and a burnup of 42.5 Gwd/MTU is acceptable for storage after a ten-year cooling time as defined at the intersection of 3.6 wt. % U-235 (rounding down) and 43 Gwd/MTU (rounding up) on the qualification table.

Table 1-2b
BWR Fuel Qualification Table for the Standardized NUHOMS®-52B DSC
 (Minimum required years of cooling time after reactor core discharge)

Burnup (GWd/ MTU)	Initial Enrichment (wt. % U-235)																				
	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0
15	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
20	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
25	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
30				5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
32					6	6	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5
34						8	8	8	8	8	8	8	8	7	6	6	6	6	6	6	6
35							10	10	10	10	9	8	8	8	8	8	8	8	6	6	6
36							11	11	11	11	11	10	10	10	10	10	10	9	8	8	8
37								13	13	12	12	12	12	11	11	11	11	11	10	10	10
38								15	14	14	14	13	13	13	13	12	12	12	12	12	11
39				Not Acceptable				18	17	17	16	16	16	15	14	14	14	14	13	13	13
40				or					21	21	20	20	19	18	17	17	16	16	16	15	15
42				Not Analyzed						22	22	22	21	21	20	20	20	19	18	17	17
44										24	24	23	23	23	22	22	21	21	21	20	20
45											25	24	24	23	23	23	22	22	22	21	21

Notes:

- Use burnup and enrichment to lookup required cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 2.0 wt. % U-235 must be qualified for storage using the alternate nuclear parameters specified in Table 1-1b. Fuel with an initial enrichment greater than 4.0 wt. % U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage. Fuel with a burnup less than 15 GWd/MTU is acceptable after three years cooling time provided the physical parameters from Table 1-1b have been met.
- Example: An assembly with an initial enrichment of 3.05 wt. % U-235 and a burnup of 34.5 GWd/MTU is acceptable for storage after a nine-year cooling time as defined at the intersection of 3.0 wt. % U-235 (rounding down) and 35 GWd/MTU (rounding up) on the qualification table.

Table 1-2c
PWR Fuel Qualification Table for the Standardized NUHOMS®-24P DSC (Fuel With BPRAs)
 (Minimum required years of cooling time after reactor core discharge)

Burnup (GWd/ MTU)	Initial Enrichment (wt. % U-235)																				
	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0
10	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
15	5	5	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
20	5	5	5	5	5	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
25	5	5	5	5	5	5	5	5	5	a	a	a	a	a	a	a	a	a	a	a	a
28	5	5	5	5	5	5	5	5	5	5	5	5	a	a	a	a	a	a	a	a	a
30	5	5	5	5	5	6	6	6	5	5	5	5	5	a	a	a	a	a	a	a	a
32	5	5	5	5	5	6	6	6	6	6	6	6	5	5	5	a	a	a	a	a	a
34	5	5	5	5	5	6	6	7	6	6	6	6	6	6	6	6	6	a	a	a	a
36	5	5	5	5	5	6	6	7	8	7	7	7	6	6	6	6	6	6	6	a	a
38	5	5	5	5	5	6	6	7	8	8	8	7	7	7	7	6	6	6	6	6	6
40	5	5	5	Not Acceptable or Not Analyzed				7	8	8	8	9	9	8	8	8	7	7	7	7	6
41	5	5	5	Not Acceptable or Not Analyzed				7	8	8	8	9	9	9	9	9	8	8	8	8	8
42	5	5	5	Not Acceptable or Not Analyzed				7	8	8	8	9	9	10	10	9	9	9	9	9	9
43	5	5	5	5	5	6	6	7	8	8	8	9	9	11	11	11	10	10	10	9	9
44	5	5	5	5	5	6	6	7	8	8	8	9	9	11	12	11	11	11	11	10	10
45	5	5	5	5	5	6	6	7	8	8	8	9	9	11	13	12	12	12	11	11	11

- a) Minimum Cooling Time 5 years, and Minimum 2350 ppm soluble boron required in the DSC cavity water during loading or unloading.

Notes:

- BPRA Burnup shall not exceed that of a BPRA irradiated in fuel assemblies with a total burnup of 36,000 MWd/MTU.
- Minimum cooling time for a BPRA is 5 years for B&W designs and 10 years for Westinghouse designs, regardless of the required assembly cooling time.
- Use burnup and enrichment to lookup minimum fuel assembly cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 2.0 wt. % U-235 must be qualified for storage using the alternate nuclear parameters specified in Table 1-1a. Fuel with an initial enrichment greater than 4.0 wt. % U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage.
- Example: An assembly with an initial enrichment of 3.65 wt. % U-235 and a burnup of 42.5 GWd/MTU is acceptable for storage after a ten-year cooling time as defined at the intersection of 3.6 wt. % U-235 (rounding down) and 43 GWd/MTU (rounding up) on the qualification table.

Table 1-2d
PWR Fuel Qualification Table for 1.2 kW per Assembly Fuel Without BPRAs for the NUHOMS®-32PT DSC
 (Minimum required years of cooling time after reactor core discharge)

Burn-Up GWd/MTU	Assembly Average Initial U-235 Enrichment, wt %																																					
	1.1	1.2	1.4	1.6	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	
10	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
15	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
20	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
25	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
28	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
30	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
32	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
34	7.0	7.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
36	8.0	8.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
38	9.0	9.0	8.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
39	10.0	9.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
40	10.0	10.0	9.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
41	11.0	10.0	10.0	9.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
42	11.5	11.0	10.0	9.0	9.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
43	13.0	11.5	10.5	10.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
44	13.5	12.5	11.5	10.5	10.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
45	14.5	14.0	12.0	11.0	10.0	10.0	10.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- For fuel assemblies reconstituted with up to 10 stainless steel rods, increase the indicated cooling time by 1.5 years. If more than 10 stainless steel rods are present, increase the indicated cooling time by 6 years.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 1.1 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a six-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

Table 1-2e
PWR Fuel Qualification Table for 0.87 kW per Assembly Fuel Without BPRAs for the NUHOMS®-32PT DSC
 (Minimum required years of cooling time after reactor core discharge)

Burn-Up GWd/MTU	Assembly Average Initial U-235 Enrichment, wt %																																																
	1.1	1.2	1.4	1.6	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0												
10	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0											
15	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0										
20	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0										
25	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0										
28	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0										
30	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0										
32	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0										
34	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0											
36	9.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0										
38	9.0	9.0	8.5	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0											
39	10.0	9.0	9.0	8.5	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0											
40	10.0	10.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0											
41	11.0	10.5	10.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0											
42	12.0	11.5	11.0	10.5	10.0	10.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0											
43	13.0	12.0	10.5	10.5	10.5	10.5	10.5	10.5	10.0	10.0	10.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0											
44	13.0	13.0	12.5	12.0	11.5	10.5	10.5	10.5	10.0	10.0	10.0	10.0	9.5	9.5	9.5	9.5	9.5	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.0	8.0											
45	14.0	13.5	13.0	12.5	12.5	12.0	12.0	12.0	12.0	10.5	10.5	11.5	10.5	10.5	10.5	10.0	10.0	10.0	9.5	10.0	10.0	10.0	10.0	10.0	10.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0										

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- *For fuel assemblies reconstituted with up to 10 stainless steel rods, increase the indicated cooling time by 1.5 years. If more than 10 stainless steel rods are present, increase the indicated cooling time by 6 years.*
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 1.1 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a eight-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

Table 1-2f
PWR Fuel Qualification Table for 0.7 kW Fuel Without BPRAs per Assembly for the NUHOMS®-32PT DSC
 (Minimum required years of cooling time after reactor core discharge)

Burn-Up GWd/ MTU	Assembly Average Initial U-235 Enrichment, wt %																																																
	1.1	1.2	1.4	1.6	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0												
10	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0										
15	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0									
20	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0									
25	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0									
28	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0									
30	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0									
32	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0										
34	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0									
36	10.5	10.0	10.0	10.0	10.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0									
38	13.0	13.0	11.5	11.5	11.0	11.0	11.0	10.5	10.5	10.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0								
39	14.0	14.0	13.5	13.0	12.0	11.5	11.5	11.5	11.5	11.5	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0								
40	14.5	14.5	14.0	14.0	13.5	13.5	13.0	13.0	12.0	12.0	12.0	12.0	11.5	11.5	11.5	11.5	11.5	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0									
41	16.5	16.0	15.5	14.5	14.0	14.0	14.0	14.0	13.5	13.5	13.5	13.5	13.5	13.5	12.5	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0									
42	18.0	16.5	16.5	16.0	15.5	15.5	14.5	14.5	14.5	14.5	14.0	14.0	14.0	14.0	14.0	14.0	13.5	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0									
43	18.5	18.0	18.0	16.5	16.5	16.5	16.5	16.0	16.0	16.0	16.0	15.5	15.5	14.5	14.5	14.5	14.5	14.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0									
44	20.0	19.0	18.5	18.5	18.0	18.0	18.0	17.5	16.5	16.5	16.5	16.5	16.0	16.0	16.0	16.0	16.0	16.0	16.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0									
45	21.0	21.0	20.0	19.0	19.0	19.0	18.5	18.5	18.0	18.0	18.0	18.0	18.0	18.0	17.5	16.5	16.5	16.5	16.5	16.0	16.0	16.0	16.0	16.0	16.0	16.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0									

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- *For fuel assemblies reconstituted with up to 10 stainless steel rods, increase the indicated cooling time by 1.5 years. If more than 10 stainless steel rods are present, increase the indicated cooling time by 6 years.*
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 1.1 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a thirteen-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

Table 1-2g
PWR Fuel Qualification Table for 0.63 kW per Assembly Fuel Without BPRAs for the NUHOMS®-32PT DSC
 (Minimum required years of cooling time after reactor core discharge)

Burn-Up GWd/ MTU	Assembly Average Initial U-235 Enrichment, wt %																																					
	1.1	1.2	1.4	1.6	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	
10	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
15	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
20	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
25	6.5	6.5	6.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
28	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
30	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
32	9.5	9.5	9.5	9.5	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0
34	11.0	11.0	11.0	10.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	
36	13.5	13.5	13.0	12.0	12.0	11.5	11.5	11.5	11.5	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
38	16.5	15.5	14.5	14.5	14.5	13.5	13.5	13.5	13.5	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	11.0	11.0	11.0	11.0
39	17.5	17.0	16.5	16.0	15.0	15.0	14.5	14.5	14.5	14.5	14.5	14.0	14.0	14.0	14.0	14.0	14.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0
40	19.0	18.0	18.0	17.0	16.5	16.5	16.5	16.5	16.0	16.0	16.0	16.0	16.0	16.0	15.0	15.0	15.0	15.0	15.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.0	13.0	13.0	13.0
41	20.5	19.5	19.0	19.0	18.0	18.0	17.5	17.5	17.5	17.0	17.0	17.0	17.0	17.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.0
42	22.0	20.5	20.5	19.5	19.5	19.5	19.0	19.0	18.5	18.5	18.5	18.0	18.0	18.0	18.0	18.0	18.0	17.0	17.0	17.0	17.0	17.0	17.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	
43	23.0	22.5	22.5	21.5	21.5	21.0	20.0	20.0	19.5	19.5	19.5	19.0	19.0	19.0	19.0	19.0	19.0	19.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	
44	24.5	24.5	23.0	23.0	22.0	22.0	22.0	22.0	21.5	21.5	21.5	21.0	21.0	21.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	18.0	18.0	18.0	18.0	18.0	18.0	
45	25.5	25.5	25.0	24.0	23.0	23.0	23.0	23.0	23.0	22.5	22.5	22.5	22.0	22.0	22.0	22.0	22.0	21.0	21.0	21.0	21.0	21.0	21.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.0	19.0	

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- *For fuel assemblies reconstituted with up to 10 stainless steel rods, increase the indicated cooling time by 1.5 years. If more than 10 stainless steel rods are present, increase the indicated cooling time by 6 years.*
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 1.1 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a sixteen-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

Table 1-2h
PWR Fuel Qualification Table for 0.6 kW per Assembly Fuel Without BPRAs for the NUHOMS®-32PT DSC
 (Minimum required years of cooling time after reactor core discharge)

Burn- Up GWd/ MTU	Assembly Average Initial U-235 Enrichment, wt %																																																
	1.1	1.2	1.4	1.6	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0												
10	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0											
15	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0											
20	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0											
25	6.5	6.5	6.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0											
28	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0											
30	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0											
32	10.5	10.5	9.5	9.5	9.5	9.5	9.5	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0											
34	12.0	12.0	12.0	11.5	11.0	11.0	11.0	11.0	11.0	11.0	11.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	9.0	9.0	9.0	9.0	9.0	9.0											
36	14.5	14.5	14.0	14.0	13.5	13.5	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0											
38	17.5	17.5	16.5	16.5	16.5	16.0	16.0	15.5	15.5	15.0	15.0	15.0	15.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0											
39	19.5	19.0	18.5	18.0	17.0	16.5	16.5	16.5	16.5	16.0	16.0	16.0	16.0	16.0	16.0	16.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0												
40	20.5	20.0	20.0	19.0	19.0	18.5	18.5	18.5	18.0	18.0	18.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	15.0	15.0	15.0	15.0	15.0	15.0												
41	22.5	21.5	21.0	21.0	20.0	20.0	19.5	19.5	19.5	19.0	19.0	19.0	19.0	19.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0												
42	24.0	22.5	22.5	21.5	21.5	21.5	21.0	21.0	21.0	21.0	21.0	20.0	20.0	20.0	20.0	20.0	20.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0												
43	25.0	24.5	24.5	23.5	23.5	23.0	22.0	22.0	22.0	21.5	21.5	21.5	21.0	21.0	21.0	21.0	21.0	21.0	21.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.0	19.0	19.0	19.0												
44	26.5	26.5	25.0	25.0	24.0	24.0	24.0	24.0	23.5	23.5	23.5	23.0	23.0	23.0	23.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	20.0	20.0												
45	27.5	27.5	27.0	26.0	26.0	25.0	25.0	25.0	25.0	24.5	24.5	24.5	24.0	24.0	24.0	24.0	24.0	24.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0												

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- *For fuel assemblies reconstituted with up to 10 stainless steel rods, increase the indicated cooling time by 1.5 years. If more than 10 stainless steel rods are present, increase the indicated cooling time by 6 years.*
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 1.1 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a nineteen-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

Table 1-2i
PWR Fuel Qualification Table for 1.2 kW per Assembly Fuel With BPRAs for the NUHOMS®-32PT DSC
 (Minimum required years of cooling time after reactor core discharge)

BU (GWd/ MTU)	Initial Enrichment wt % U-235																																
	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0		
10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
20	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
25	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
28	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
30	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
32	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
34	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
36	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
38	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
39	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
40	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
41	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
42	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
43	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
44	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
45	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 2.0 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a six-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

Table 1-2j
PWR Fuel Qualification Table for 0.87 kW per Assembly Fuel With BPRAs for the NUHOMS®-32PT DSC
 (Minimum required years of cooling time after reactor core discharge)

BU (GWd/ MTU)	Initial Enrichment wt % U-235																														
	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0
10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
20	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
25	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
28	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
30	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
32	5	5	5	5	5	5	6	6	6	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
34	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
36	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
38	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
39	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
40	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
41	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
42	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
43	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
44	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
45	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 2.0 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a eight-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

Table 1-2k
PWR Fuel Qualification Table for 0.7 kW per Assembly Fuel With BPRAs for the NUHOMS®-32PT DSC
 (Minimum required years of cooling time after reactor core discharge)

BU (GWd/ MTU)	Initial Enrichment wt % U-235																														
	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0
10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
20	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
25		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
28				6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5	5	5	5	5
30						6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
32							7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
34								8	8	8	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	7	7	7	7	7
36									9	9	9	9	9	9	9	9	9	9	8	8	8	8	8	8	8	8	8	8	8	8	8
38											10	10	10	10	10	10	10	10	10	10	10	10	9	9	9	9	9	9	9	9	9
39											11	11	11	11	11	11	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
40			Not Analyzed									12	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
41												13	13	12	12	12	12	12	12	12	12	12	12	12	12	12	12	11	11	11	11
42												14	14	13	13	13	13	13	13	13	13	13	13	13	12	12	12	12	12	12	12
43													15	14	14	14	14	14	14	14	14	14	14	14	13	13	13	13	13	13	13
44														16	15	15	15	15	15	15	15	15	15	15	15	14	14	14	14	14	14
45															17	17	16	16	16	16	16	16	16	16	16	16	15	15	15	15	15

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 2.0 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a thirteen-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

Table 1-21
PWR Fuel Qualification Table for 0.63 kW per Assembly Fuel With BPRAs for the NUHOMS®-32PT DSC
 (Minimum required years of cooling time after reactor core discharge)

BU (GWd/ MTU)	Initial Enrichment wt % U-235																															
	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	
10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
20	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
25		6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	
28				7	7	7	7	7	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	
30						7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	
32							8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
34								10	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
36									11	11	11	11	11	11	11	11	11	11	11	10	10	10	10	10	10	10	10	10	10	10	10	
38											13	13	13	13	13	13	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
39											14	14	14	14	14	14	14	13	13	13	13	13	13	13	13	13	13	13	13	13	13	
40			Not Analyzed									15	15	15	15	15	15	15	14	14	14	14	14	14	14	14	14	14	14	14	14	
41												16	16	16	16	16	16	16	16	16	16	16	15	15	15	15	15	15	15	15	15	
42												18	18	17	17	17	17	17	17	17	17	17	17	17	16	16	16	16	16	16	16	
43													19	19	19	19	18	18	18	18	18	18	18	18	18	18	18	18	18	17	17	17
44														20	20	20	20	20	20	20	19	19	19	19	19	19	19	19	19	19	19	
45														22	21	21	21	21	21	21	21	21	21	20	20	20	20	20	20	20	20	

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 2.0 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a seventeen-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

Table 1-2m
PWR Fuel Qualification Table for 0.6 kW per Assembly Fuel With BPRAs for the NUHOMS®-32PT DSC
 (Minimum required years of cooling time after reactor core discharge)

BU (GWd/ MTU)	Initial Enrichment wt % U-235																															
	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	
10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
20	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
25	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
28	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
30	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
32	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	8	8	8	8	8
34	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
36	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	11	11	11	11	11
38	15	15	15	15	15	15	15	15	15	15	15	15	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	13	13
39	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
40	Not Analyzed											17	17	17	17	17	17	17	17	16	16	16	16	16	16	16	16	16	16	16	16	16
41												19	18	18	18	18	18	18	18	18	18	18	18	18	17	17	17	17	17	17	17	17
42												20	20	20	20	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
43												21	21	21	21	21	21	21	21	21	20	20	20	20	20	20	20	20	20	20	20	20
44													23	22	22	22	22	22	22	22	22	22	22	22	22	22	21	21	21	21	21	21
45													24	24	24	24	24	24	23	23	23	23	23	23	23	23	23	23	23	23	23	22

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 2.0 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a nineteen-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

Table 1-2n
PWR Fuel Qualification Table for Zone 1 with 0.7 kW per Assembly, Fuel With or Without BPRAs, for the
NUHOMS®-24PHB DSC

(Minimum required years of cooling time after reactor core discharge)

BU (Gwd/MT U)	Assembly Average Initial U-235 Enrichment (wt %)																									
	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5
10	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
15	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
20	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
25		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
28			5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
30						6.5	6.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
32							7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
34								8.0	8.0	8.0	8.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
36									9.0	9.0	9.0	9.0	9.0	9.0	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
38											10.5	10.5	10.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	9.5	9.5	9.5	9.5
39											11.5	11.0	11.0	11.0	11.0	11.0	11.0	11.0	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
40											12.0	12.0	12.0	12.0	12.0	12.0	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.0	11.0	11.0
41											13.0	13.0	13.0	13.0	13.0	13.0	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.0	12.0	12.0
42											14.5	14.5	14.0	14.0	14.0	14.0	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.0	13.0	13.0
43			Not Analyzed								15.5	15.5	15.5	15.0	15.0	15.0	15.0	15.0	14.5	14.5	14.5	14.5	14.5	14.5	14.0	14.0
44			Not Analyzed								17.0	16.5	16.5	16.5	16.5	16.5	16.0	16.0	16.0	16.0	16.0	15.5	15.5	15.5	15.5	15.5
45													18.0	17.5	17.5	17.5	17.5	17.0	17.0	17.0	17.0	17.0	16.5	16.5	16.5	16.5
46													18.8	18.7	18.5	18.5	18.3	18.2	18.1	18.0	17.9	17.8	17.7	17.6	17.5	17.4
47													20.1	20.0	19.9	19.6	19.6	19.5	19.4	19.2	19.1	19.0	18.9	18.8	18.7	18.7
48													21.4	21.3	21.1	21.0	20.8	20.8	20.7	20.5	20.4	20.3	20.2	20.1	20.0	19.9
49													22.7	22.6	22.4	22.3	22.1	22.1	21.9	21.8	21.7	21.6	21.5	21.4	21.3	21.2
50															23.7	23.6	23.5	23.4	23.3	23.2	23.0	22.9	22.8	22.7	22.6	22.5
51															25.0	24.9	24.8	24.6	24.5	24.4	24.3	24.2	24.0	23.9	23.8	23.7
52															26.3	26.2	26.0	25.9	25.8	25.7	25.6	25.4	25.3	25.2	25.2	25.0
53															27.5	27.3	27.2	27.1	27.0	26.9	26.8	26.7	26.5	26.4	26.4	26.3
54															28.8	28.6	28.5	28.3	28.2	28.1	28.0	28.0	27.8	27.7	27.6	27.5
55															29.9	29.8	29.7	29.6	29.5	29.3	29.2	29.1	29.0	28.9	28.8	28.7

- BU = Assembly average burnup
- Use burnup and enrichment to lookup minimum cooling time in years. For fuel assemblies reconstituted with up to 10 stainless steel rods only, if the lookup cooling time is less than 9.0 years then a minimum cooling time of 9.0 years shall be used. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment greater than 4.5 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 46.5 GWd/MTU is acceptable for storage after a 19.5 years cooling time as defined by 3.7 wt. % U-235 (rounding down) and 47 GWd/MTU (rounding up) on the qualification table.
- See Figure 1-8 for a description of zones.
- For assemblies fuel reconstituted with Zircaloy clad uranium-oxide rods use the assembly average enrichment to determine the minimum cooling time.

Table 1-2o
PWR Fuel Qualification Table for Zone 2 with 1.0 kW per Assembly, Fuel With or Without BPRAs, for the
NUHOMS®-24PHB DSC
 (Minimum required years of cooling time after reactor core discharge)

BU (GWd/MTU)	Assembly Average Initial U-235 Enrichment (wt %)																											
	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5		
10	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
15	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
20	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
25		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
28			5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
30						5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
32							5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
34								5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
36									5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5		
38											6.0	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5		
39											6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.5	5.5	5.5	5.5	5.5	5.5	5.5		
40											6.5	6.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
41											6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0		
42											7.0	7.0	7.0	7.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		
43											7.5	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.5	6.5	6.5	6.5		
44											7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		
45			Not Analyzed											8.0	8.0	8.0	8.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.4		
46														8.2	8.1	8.0	8.0	7.9	7.8	7.8	7.7	7.7	7.6	7.6	7.5	7.4		
47														8.7	8.6	8.5	8.4	8.3	8.2	8.2	8.1	8.0	8.0	7.9	7.9	7.8		
48														9.2	9.1	9.0	8.9	8.8	8.7	8.6	8.6	8.5	8.5	8.4	8.3	8.3		
49														9.8	9.7	9.6	9.5	9.4	9.3	9.2	9.2	9.1	9.0	8.9	8.8	8.7		
50																10.2	10.1	10.0	9.9	9.8	9.7	9.6	9.6	9.5	9.4	9.3		
51																10.9	10.8	10.7	10.6	10.5	10.3	10.3	10.2	10.1	10.0	9.9		
52																11.6	11.5	11.3	11.2	11.1	11.0	10.9	10.8	10.7	10.6	10.5		
53																12.4	12.2	12.1	12.0	11.9	11.8	11.6	11.5	11.4	11.3	11.1		
54																13.2	13.1	13.0	12.8	12.7	12.5	12.4	12.3	12.2	12.1	12.0		
55																14.1	13.9	13.8	13.6	13.5	13.4	13.2	13.1	13.0	12.9	12.8		

- BU = Assembly average burnup
- Use burnup and enrichment to lookup minimum cooling time in years. For fuel assemblies reconstituted with up to 10 stainless steel rods only, if the lookup cooling time is less than 9.0 years then a minimum cooling time of 9.0 years shall be used. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment greater than 4.5 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 46.5 GWd/MTU is acceptable for storage after a 8.3 years cooling time as defined by 3.7 wt. % U-235 (rounding down) and 47 GWd/MTU (rounding up) on the qualification table.
- See Figure 1-8 for a description of zones.
- For assemblies fuel reconstituted with Zircaloy clad uranium-oxide rods use the assembly average enrichment to determine the minimum cooling time.

Table 1-2p
PWR Fuel Qualification Table for Zone 3 with 1.3 kW per Assembly, Fuel With or Without BPRAs, for the
NUHOMS®-24PHB DSC
 (Minimum required years of cooling time after reactor core discharge)

BU (GWd/MTU)	Assembly Average Initial U-235 Enrichment (wt %)																									
	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5
10	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
15	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
20	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
25		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
28			5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
30						5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
32							5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
34								5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
36									5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
38											5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
39											5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
40											5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
41											5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
42											6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
43											6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
44											6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
45			Not Analyzed										6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
46													6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
47													6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
48													6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
49													6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
50														6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
51														6.7	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
52														7.0	6.9	6.9	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
53														7.3	7.2	7.2	7.1	7.1	7.0	6.9	6.9	6.9	6.9	6.9	6.9	6.9
54														7.7	7.6	7.5	7.4	7.4	7.3	7.3	7.2	7.1	7.1	7.0	7.0	7.0
55														8.0	8.0	7.9	7.8	7.7	7.7	7.6	7.5	7.5	7.4	7.3	7.3	7.3

- BU = Assembly average burnup
- Use burnup and enrichment to lookup minimum cooling time in years. For fuel assemblies reconstituted with up to 10 stainless steel rods only, if the lookup cooling time is less than 9.0 years then a minimum cooling time of 9.0 years shall be used. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment greater than 4.5 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 46.5 GWd/MTU is acceptable for storage after a 6.2 years cooling time as defined by 3.7 wt. % U-235 (rounding down) and 47 GWd/MTU (rounding up) on the qualification table.
- See Figure 1-8 and 1-9 for a description of zones.
- For fuel assemblies reconstituted with Zircaloy clad uranium-oxide rods use the assembly average enrichment to determine the minimum cooling time.

Table 1-2q
BWR Fuel Qualification Table for NUHOMS®-61BT DSC

(Minimum required years of cooling time after reactor core discharge)

BU (Gwd /MTU)	Initial Enrichment																																		
	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4				
10	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4				
15	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4				
20	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4				
25	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4			
28	Not Acceptable or Not Analyzed				6	6	6	6	6	6	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5			
30					7	7	7	7	7	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	
32					8	8	8	8	8	7	7	7	7	7	7	7	7	7	7	7	7	7	7	6	6	6	6	6	6	6	6	6	6	6	
34					9	9	9	9	9	9	8	8	8	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	7	7	7	7	7	7
36					11	11	11	10	10	10	10	10	10	9	9	9	9	9	9	9	9	9	8	8	8	8	8	8	8	8	8	8	8	8	8
38					14	13	13	12	12	12	12	12	11	11	11	11	11	11	10	10	10	10	10	10	10	9	9	9	9	9	9	9	9	9	9
39					15	14	14	14	13	13	13	13	12	12	12	12	12	11	11	11	11	11	11	11	10	10	10	10	10	10	10	9	9	9	9
40					16	16	15	15	15	15	14	14	14	13	13	13	12	12	12	12	12	12	12	12	11	11	11	11	11	10	10	10	10	10	10

This Table provides an alternate methodology as cross referenced in Table 1-1c and 1-1j for determination of fuel assemblies qualified for storage in NUHOMS®-61BT DSC.

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are conservatively applied in determination of actual values for these two parameters.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 1.4 and greater than 4.4 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 40 GWd/MTU is unacceptable for storage.
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 4 years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 39.5 GWd/MTU is acceptable for storage after a eleven-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 40 GWd/MTU (rounding up) on the qualification table.

Table 1-3a
PWR Fuel Qualification Table for Zone 1 Fuel with 1.7 kW per Assembly for the NUHOMS®-24PTH DSC (Fuel w/o CCs)

(Minimum required years of cooling time after reactor core discharge)

Burn- Up, GWd/MT	Assembly Average Initial U-235 Enrichment, wt %																																		
	1.5	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0			
10	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
15	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
20	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
25		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
28			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
30				3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
32					3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
34						3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
36							3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		
38								3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		
39									3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		
40										3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		
41											4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
42												4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
43													4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
44														4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
45															4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
46																4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		
47																	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		
48																		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		
49																			4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		
50																					5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
51																						5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
52																							5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
53																								5.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
54																									5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
55																										5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
56																											6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
57																												6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
58																													6.0	6.0	6.0	6.0	6.0	6.0	6.0
59																														6.5	6.5	6.5	6.5	6.5	6.5
60																															6.5	6.5	6.5	6.5	6.5
61																																7.0	7.0	7.0	7.0
62																																	7.0	7.0	7.0

Not Analyzed

Note: If stainless steel reconstituted rods are present in the fuel assembly, add an additional year of cooling time.

Note: If stainless steel reconstituted rods are present in the fuel assembly, add an additional year of cooling time.

Note: Page A-53 provides the explanatory notes and limitations regarding the use of this Table.

Table 1-3b
PWR Fuel Qualification Table for Zone 2 Fuel with 2.0 kW per Assembly for the NUHOMS®-24PTH DSC (Fuel w/o CCs)
 (Minimum required years of cooling time after reactor core discharge)

Burn-Up, GWD/MT	Assembly Average Initial U-235 Enrichment, wt %																																	
	1.5	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0		
10	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
15	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
20	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
25		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
28			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
30				3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
32					3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
34						3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
36							3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
38								3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
39								3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
40									3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
41										3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
42											3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
43												3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0		
44													3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		
45														3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		
46															3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		
47																4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		
48																	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
49																		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
50																			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
51																				4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
52																					4.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
53																						4.5	4.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0	4.0		
54																							4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.0	
55																								4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
56																									4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
57																										4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
58																											4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
59																												4.5	4.5	4.5	4.5	4.5	4.5	4.5
60																													4.5	4.5	4.5	4.5	4.5	4.5
61																														4.5	4.5	4.5	4.5	4.5
62																															4.5	4.5	4.5	4.5

Not Analyzed

Note: If stainless steel reconstituted rods are present in the fuel assembly, add an additional year of cooling time.

Note: If stainless steel reconstituted rods are present in the fuel assembly, add an additional year of cooling time.

Note: Page A-53 provides the explanatory Notes and limitations regarding the use of this Table.

Table 1-3c
PWR Fuel Qualification Table for Zone 3 Fuel with 1.5 kW per Assembly for the NUHOMS®-24PTH DSC (Fuel w/o CCs)
 (Minimum required years of cooling time after reactor core discharge)

Burn- Up, GWD/MT	Assembly Average Initial U-235 Enrichment, wt %																															
	1.5	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0
10	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
15	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
20	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
25		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
28			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
30						3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
32							3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
34								3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
36								3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
38									4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
39									4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
40									4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
41									4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
42									4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
43									4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
44									4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
45									4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
46									5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
47									5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
48									5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
49									5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
50									5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
51									5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
52									6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
53									6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
54									6.5	6.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
55									6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
56									7.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
57									7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
58									7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
59									7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
60									8.0	8.0	8.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
61									8.5	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
62									8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5

Not Analyzed

Note: If stainless steel reconstituted rods are present in the fuel, assembly, add an additional year of cooling time.

Note: Page A-53 provides the explanatory notes and limitations regarding the use of this Table.

Table 1-3d
PWR Fuel Qualification Table for Zone 4 Fuel with 1.3 kW per Assembly for the NUHOMS®-24PTH DSC (Fuel w/o CCs)
 (Minimum required years of cooling time after reactor core discharge)

Burn-Up, GWD/MT	Assembly Average Initial U-235 Enrichment, wt %																																
	1.5	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	
10	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
15	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
20	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
25		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
28			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
30				3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
32					3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
34						4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
36							4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
38								4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
39									4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
40										4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
41											5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
42												5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
43													5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
44														5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
45															5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
46																5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
47																	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
48																		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
49																			6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	
50																				6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	
51																					7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
52																						7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
53																							7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	
54																								7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	
55																									8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	
56																										8.0	8.0	8.0	8.0	8.0	8.0	8.0	
57																											8.5	8.5	8.5	8.5	8.5	8.5	
58																												9.0	9.0	9.0	9.0	9.0	
59																													9.5	9.5	9.5	9.5	
60																														10.0	10.0	10.0	
61																															10.5	10.5	
62																																11.0	11.0

Not Analyzed

Note: If stainless steel reconstituted rods are present in the fuel, assembly, add an additional year of cooling time or for cooling times less than 10 years.

Not Analyzed

Note: If stainless steel reconstituted rods are present in the fuel, assembly, add an additional year of cooling time or for cooling times less than 10 years.

Note: Page A-53 provides the explanatory notes and limitations regarding the use of this Table.

Table 1-3e
PWR Fuel Qualification Table for Zone 1 Fuel with 1.7 kW per Assembly for the NUHOMS®-24PTH DSC (Fuel w/ CCs)
 (Minimum required years of cooling time after reactor core discharge)

Burn- Up, GWD/MT	Assembly Average Initial U-235 Enrichment, wt %																																
	1.5	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	
10	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
15	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
20	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
25		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
28			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
30				3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
32					3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
34						3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
36							3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
38								3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
39									3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
40										3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
41											4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
42												4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
43													4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
44														4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
45															4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
46																4.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
47																	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
48																		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
49																			4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
50																					5.0	5.0	5.0	5.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
51																						5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
52																							5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
53																								5.5	5.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
54																									5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
55																										5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
56																											6.0	6.0	6.0	6.0	6.0	6.0	6.0
57																												6.0	6.0	6.0	6.0	6.0	6.0
58																													6.5	6.0	6.0	6.0	6.0
59																														6.5	6.5	6.5	6.5
60																															6.5	6.5	6.5
61																																7.0	7.0
62																																	7.0

Not Analyzed

Note: If stainless steel reconstituted rods are present in the fuel, assembly, add an additional year of cooling time.

Not Analyzed

Note: If stainless steel reconstituted rods are present in the fuel, assembly, add an additional year of cooling time.

Note: Page A-53 provides the explanatory notes and limitations regarding the use of this Table.

Table 1-3f
PWR Fuel Qualification Table for Zone 2 Fuel with 2.0 kW per Assembly for the NUHOMS®-24PTH DSC (Fuel w/ CCs)
 (Minimum required years of cooling time after reactor core discharge)

Burn- Up, GWD/MT	Assembly Average Initial U-235 Enrichment, wt %																																		
	1.5	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0			
10	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
15	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
20	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
25			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
28				3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
30					3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
32						3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
34							3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
36								3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
38									3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
39										3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
40											3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
41												3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
42													3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
43														3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0			
44															3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5			
45																3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5			
46																	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5			
47																		4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5			
48																			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5			
49																				4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5			
50																					4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
51																						4.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
52																							4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5			
53																								4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5			
54																									4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		
55																										4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		
56																											5.0	5.0	5.0	5.0	5.0	5.0	5.0		
57																												5.0	5.0	5.0	5.0	5.0	5.0		
58																													5.0	5.0	5.0	5.0	5.0		
59																														5.5	5.0	5.0	5.0		
60																															6.0	5.5	5.5		
61																																6.0	5.5	5.5	
62																																	6.0	6.0	5.5

Not Analyzed

Note: If stainless steel reconstituted rods are present in the fuel, assembly, add an additional year of cooling time.

Note: If stainless steel reconstituted rods are present in the fuel, assembly, add an additional year of cooling time.

Note: Page A-53 provides the explanatory notes and limitations regarding the use of this Table.

Table 1-3g
PWR Fuel Qualification Table for Zone 3 Fuel with 1.5 kW per Assembly for the NUHOMS®-24PTH DSC (Fuel w/ CCs)
 (Minimum required years of cooling time after reactor core discharge)

Burn-Up, GWD/MT	Assembly Average Initial U-235 Enrichment, wt %																															
	1.5	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0
10	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
15	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
20	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
25			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
28				3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
30							3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
32								3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
34								3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
36								3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
38									4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
39									4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5
40									4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
41									4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
42									4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
43									4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
44									4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
45									5.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
46									5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
47									5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.5	4.5	4.5	4.5
48									5.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
49									5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
50									5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
51									5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
52									6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
53									6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
54									6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
55									6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
56									7.0	7.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
57									7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
58									7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
59									7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
60									8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
61									8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
62									9.0	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5

Not Analyzed

Note: If stainless steel reconstituted rods are present in the fuel, assembly, add an additional year of cooling time.

Not Analyzed

Note: If stainless steel reconstituted rods are present in the fuel, assembly, add an additional year of cooling time.

Note: Page A-53 provides the explanatory notes and limitations regarding the use of this Table.

Table 1-3h
PWR Fuel Qualification Table for Zone 4 Fuel with 1.3 kW per Assembly for the NUHOMS®-24PTH DSC (Fuel w/ CCs)
 (Minimum required years of cooling time after reactor core discharge)

Burn- Up, GWD/MT	Assembly Average Initial U-235 Enrichment, wt %																																	
	1.5	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0		
10	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
15	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
20	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
25		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
28			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
30							3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		
32								3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		
34									4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
36										4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
38											4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		
39												4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		
40													4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		
41														5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
42															5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
43																5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
44																	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
45																		5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
46																			5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
47																				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
48																					6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
49																						6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	
50																							6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	
51																								7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
52																									7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
53																										7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
54																											7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
55																												8.0	8.0	8.0	8.0	8.0	8.0	8.0
56																													8.0	8.0	8.0	8.0	8.0	8.0
57																														8.5	8.5	8.5	8.5	8.5
58																															8.5	8.5	8.5	8.5
59																																9.0	9.0	9.0
60																																	9.5	9.5
61																																		10.0
62															</																			

Not Analyzed

Note: If stainless steel reconstituted rods are present in the fuel, assembly, add an additional year of cooling time for cooling times less than 10 years.

Note: Page A-53 provides the explanatory notes and limitations regarding the use of this Table.

Notes: Tables 1-3a through 1-3h:

- Burnup = Assembly Average burnup.
- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an assembly average initial enrichment less than 1.5 (or less than the minimum provided above for each burnup) and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 62 GWd/MTU is unacceptable for storage.
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 3-years cooling.
- See Figures 1-11 through 1-15 for the description of Zones.
- For fuel assemblies reconstituted with uranium-oxide rods, use the assembly average equivalent enrichment to determine the minimum cooling time.
- The cooling times for damaged and intact assemblies are identical.
- *Example:* An intact fuel assembly without CCs, with a decay heat load of 1.7 kW or less, an initial enrichment of 3.65 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a 4.0 year cooling time as defined by 3.6 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) in Table 1-3a.

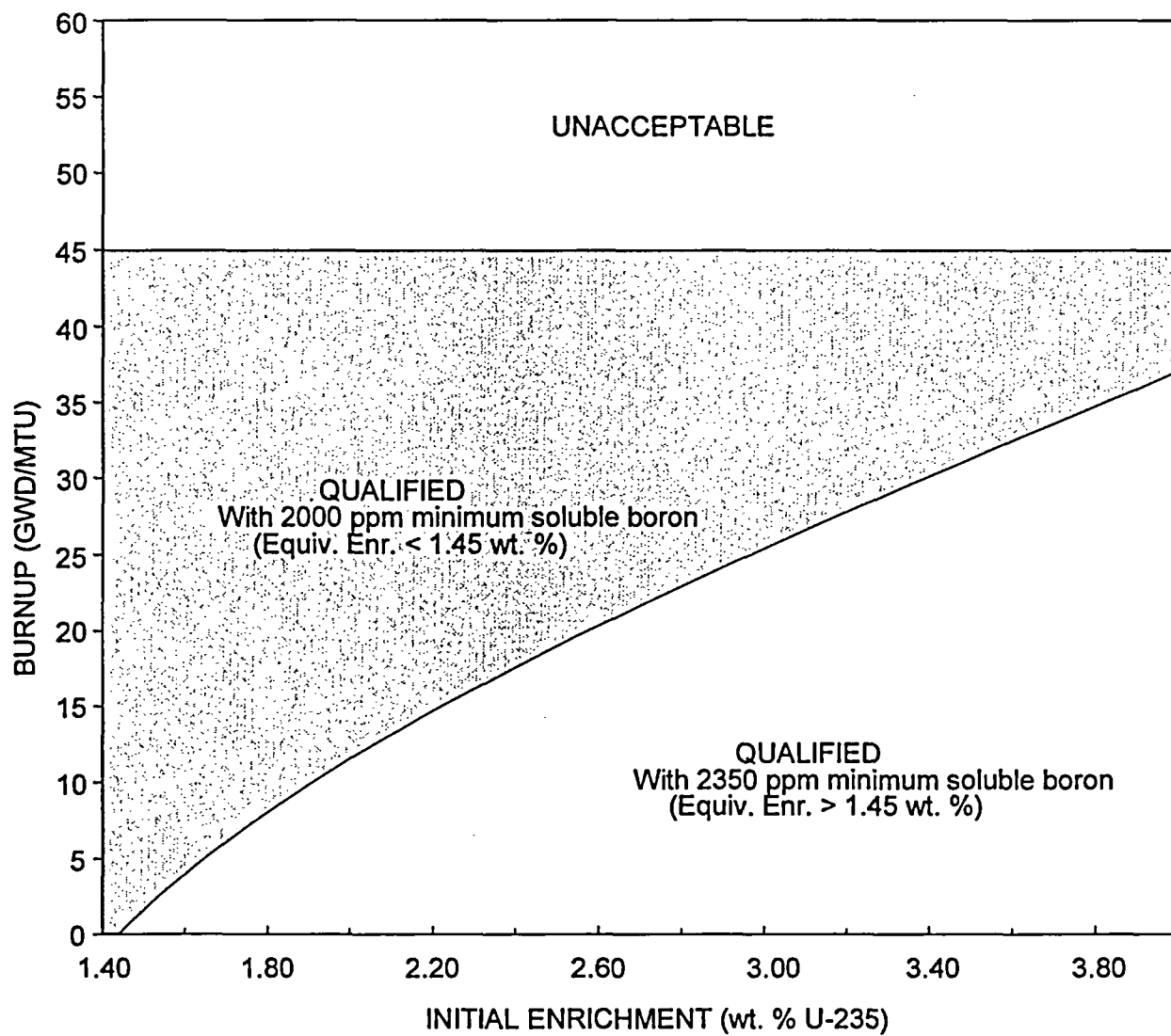


Figure 1-1
PWR Fuel Criticality Acceptance Curve

	0.87	0.87	0.87	0.87	
0.87	0.63	0.63	0.63	0.63	0.87
0.87	0.63	0.63	0.63	0.63	0.87
0.87	0.63	0.63	0.63	0.63	0.87
0.87	0.63	0.63	0.63	0.63	0.87
	0.87	0.87	0.87	0.87	

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Figure 1-2
Heat Load Zoning Configuration 1 for the NUHOMS®-32PT DSC

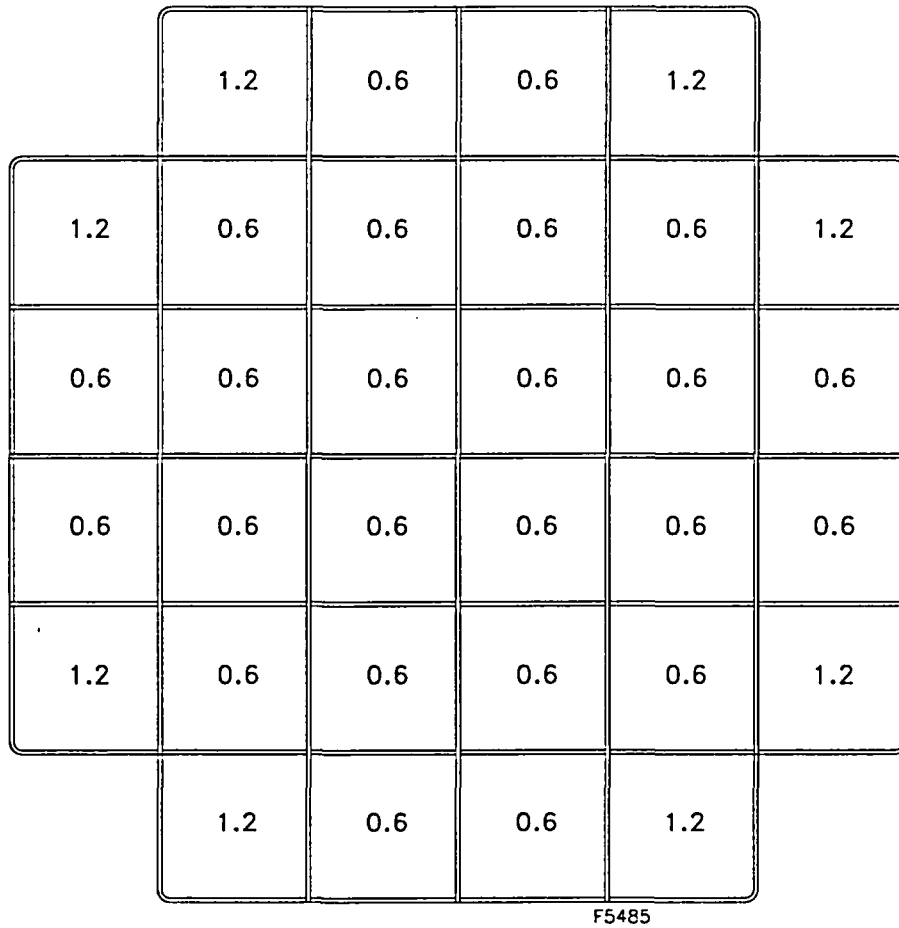


Figure 1-3
Heat Load Zoning Configuration 2 for the NUHOMS®-32PT DSC

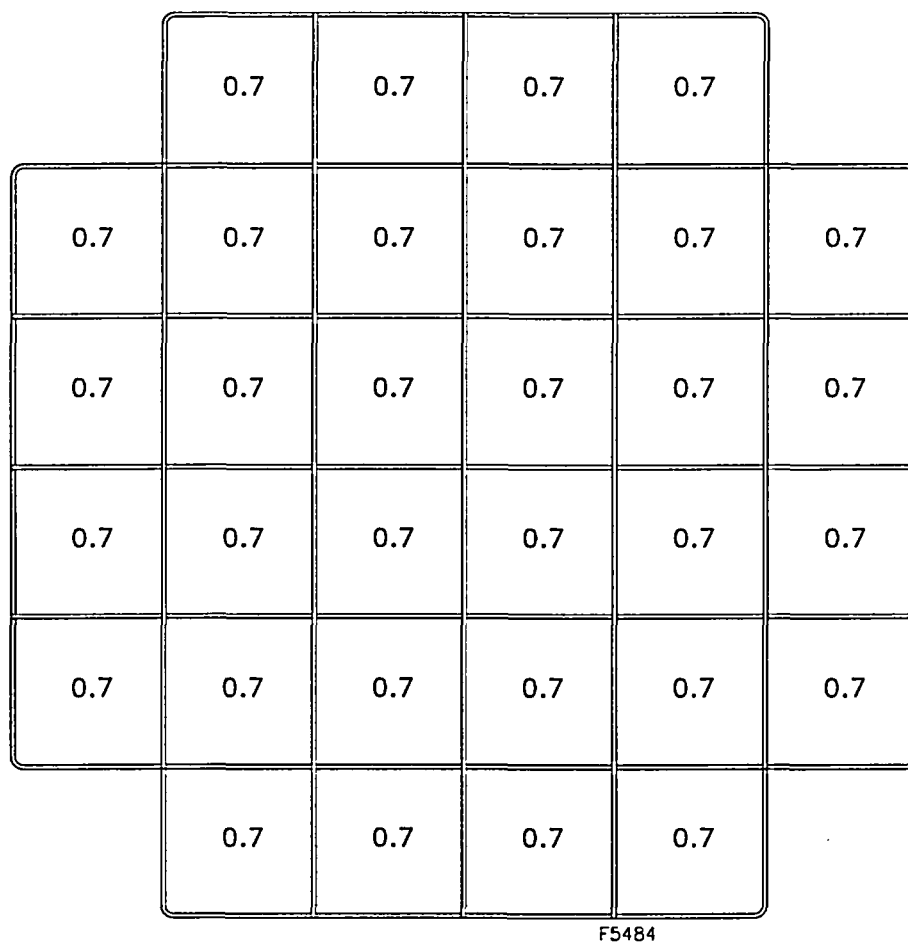


Figure 1-4
Heat Load Zoning Configuration 3 for the NUHOMS®-32PT DSC

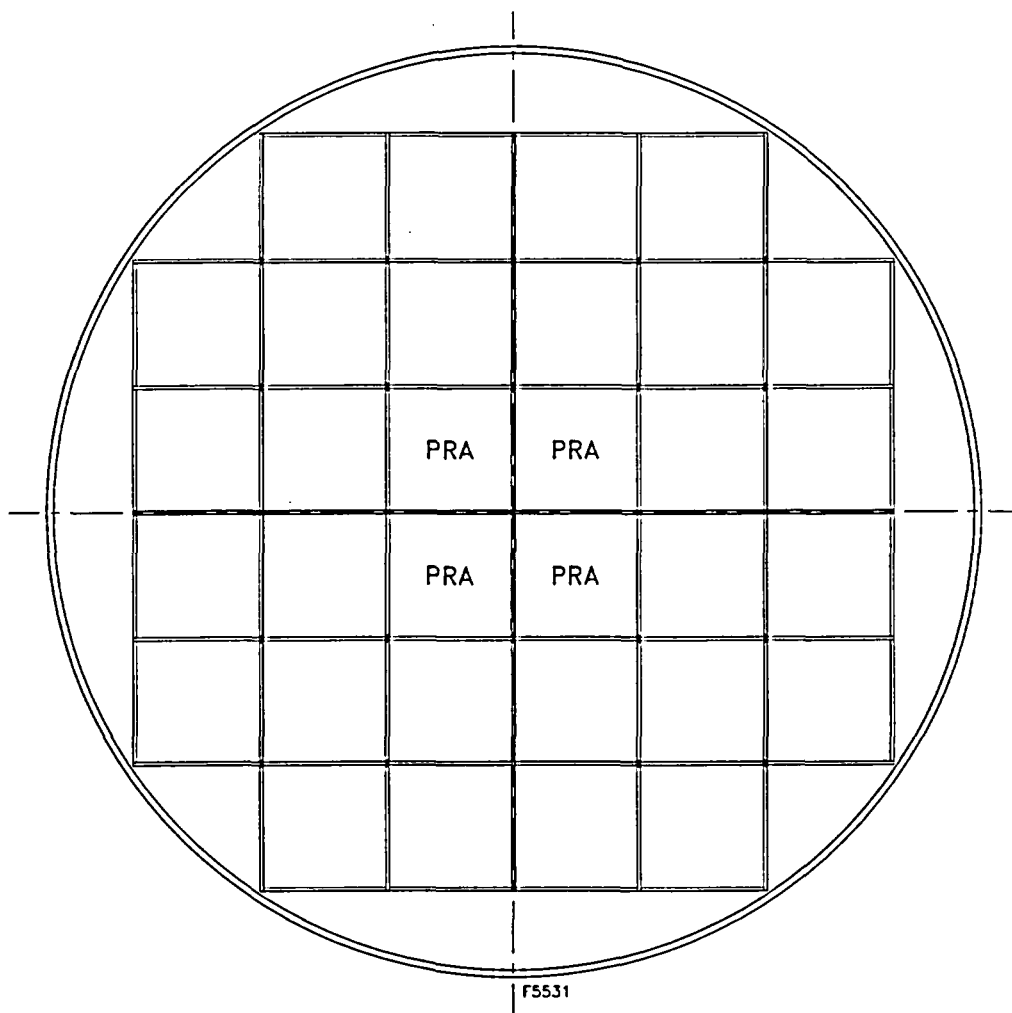
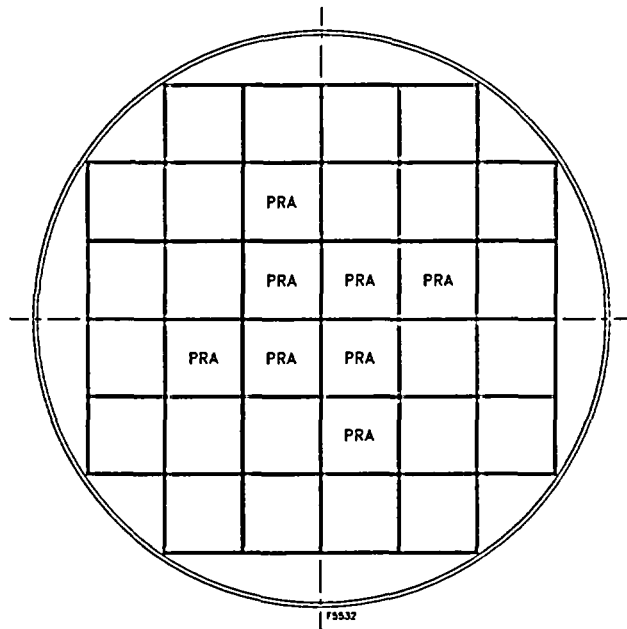


Figure 1-5
Required PRA Locations for the NUHOMS®-32PT DSC Configuration with Four PRAs



Or

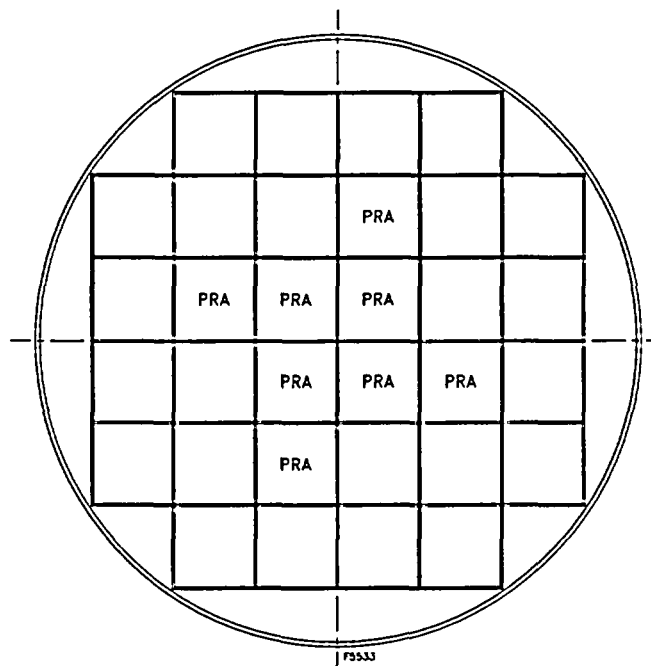


Figure 1-6
Required PRA Locations for the NUHOMS®-32PT DSC Configuration with Eight PRAs

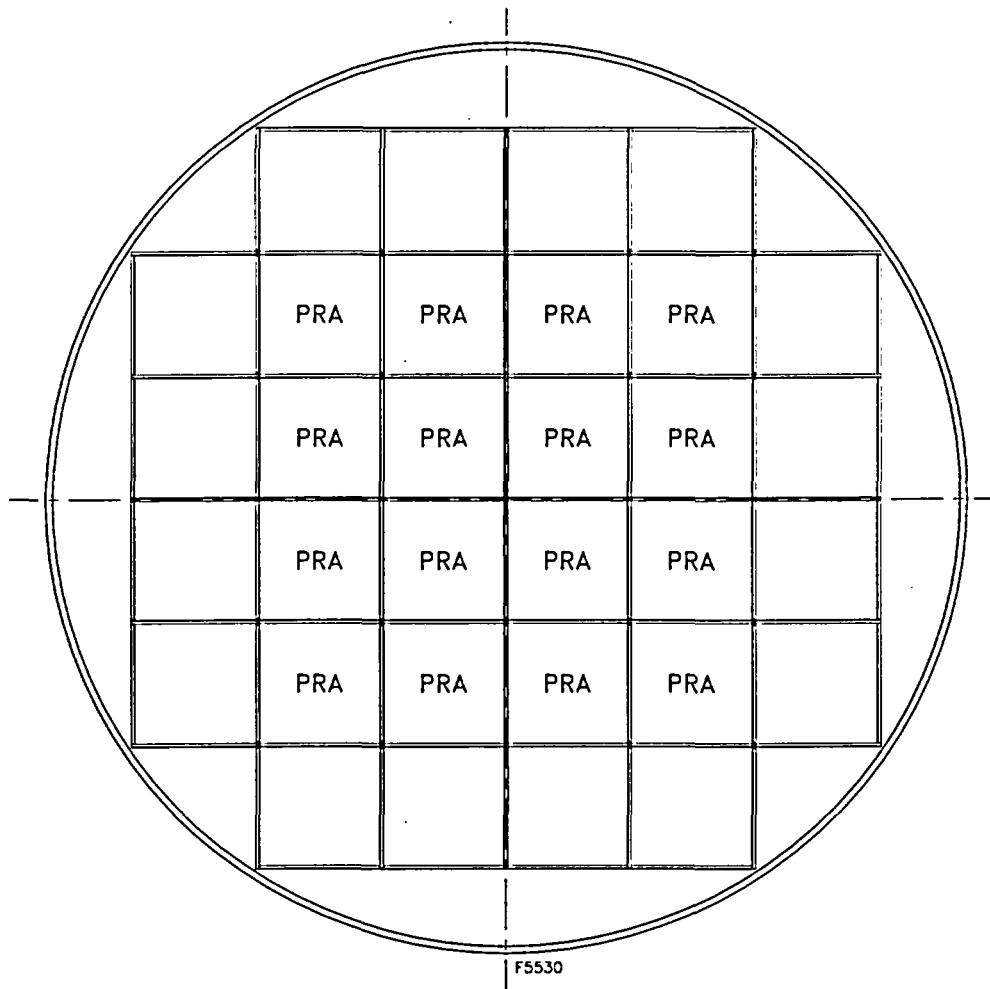
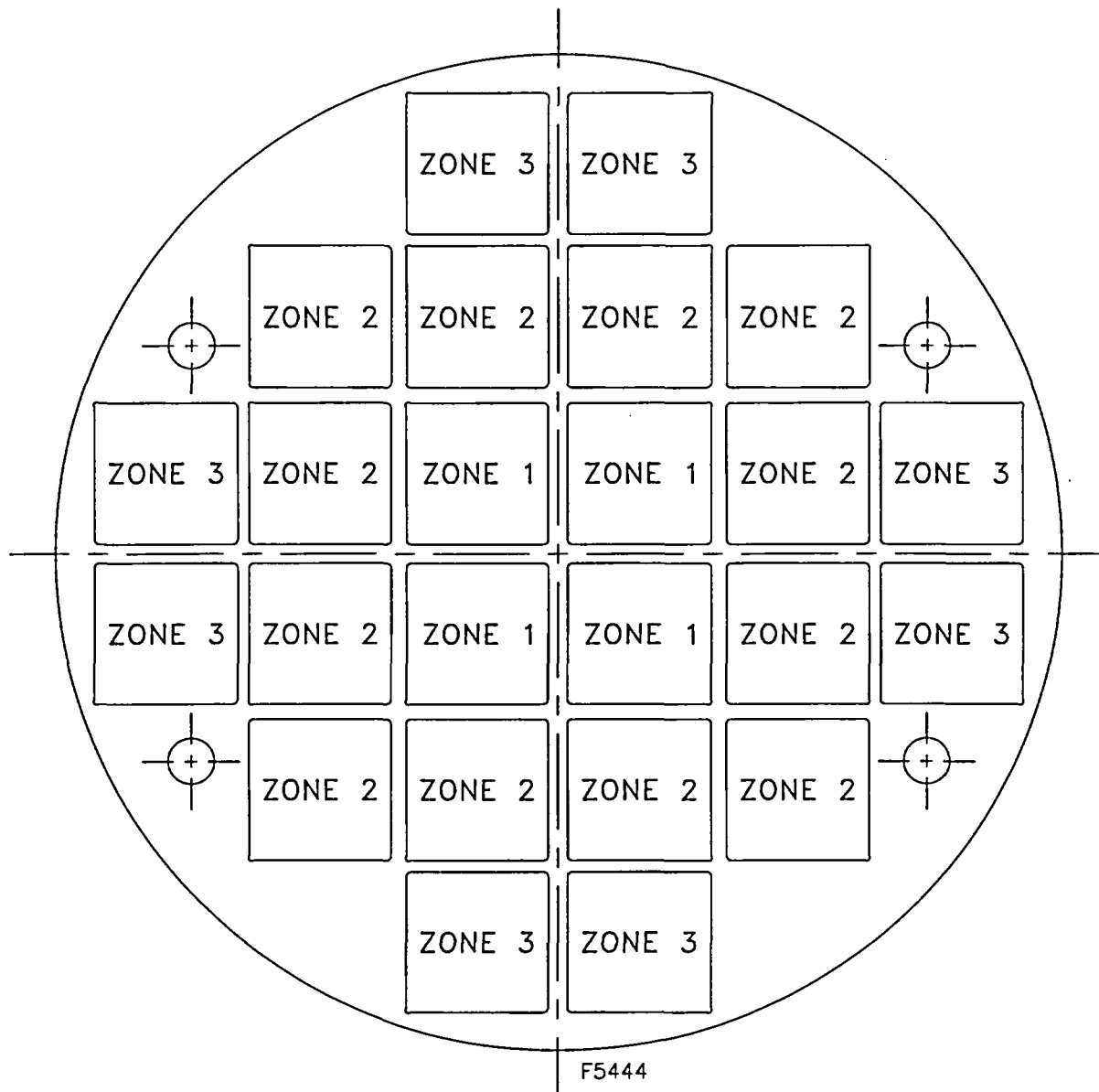
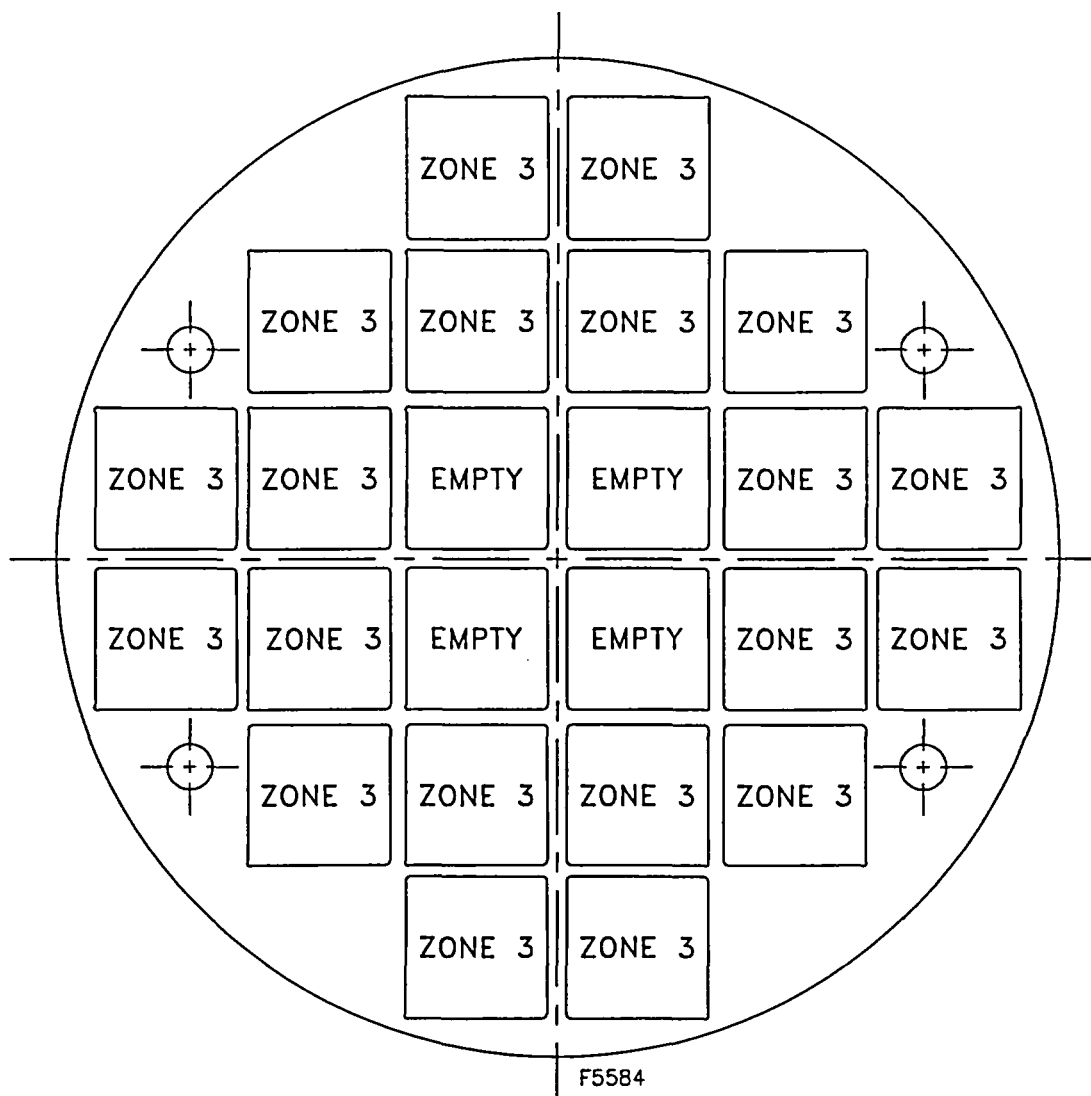


Figure 1-7
Required PRA Locations for the NUHOMS®-32PT DSC Configuration with Sixteen PRAs



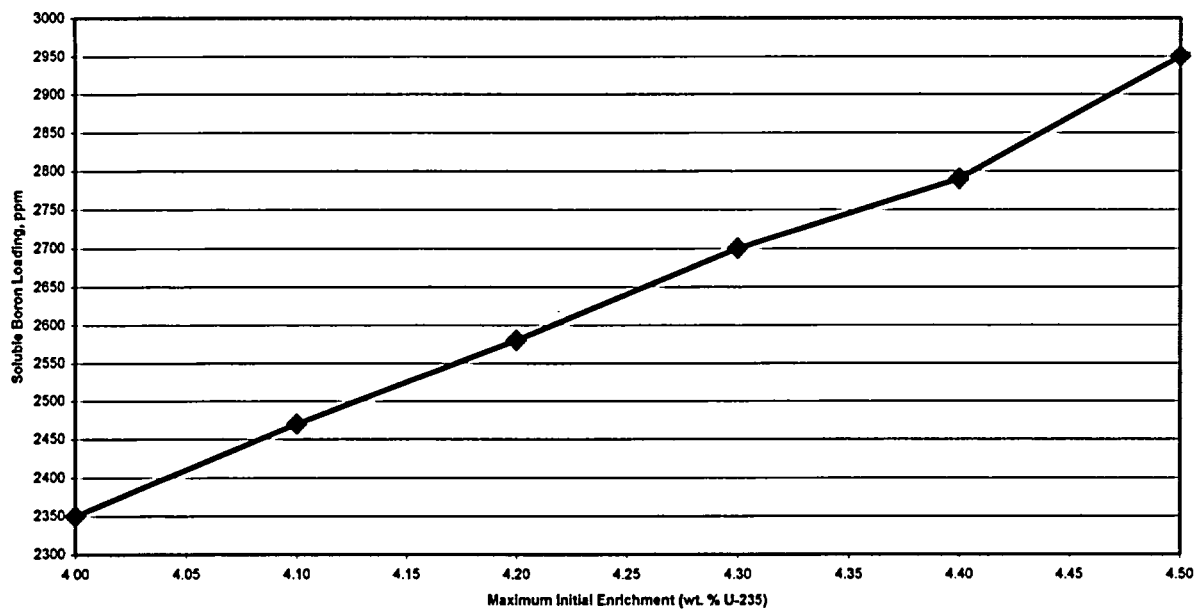
	Zone 1	Zone 2	Zone 3
Maximum Decay Heat (kW / FA)	0.7	1.0	1.3
Maximum Decay Heat per Zone (kW)	2.8	10.8	10.4

Figure 1-8
Heat Load Zoning Configuration for Fuel Assemblies (With or Without BPRAs)
Stored in NUHOMS®-24PHB DSC – Configuration 1



	Zone 1	Zone 2	Zone 3
Maximum Decay Heat (kW / FA)	NA	NA	1.3
Maximum Decay Heat per Zone (kW)	NA	NA	24.0

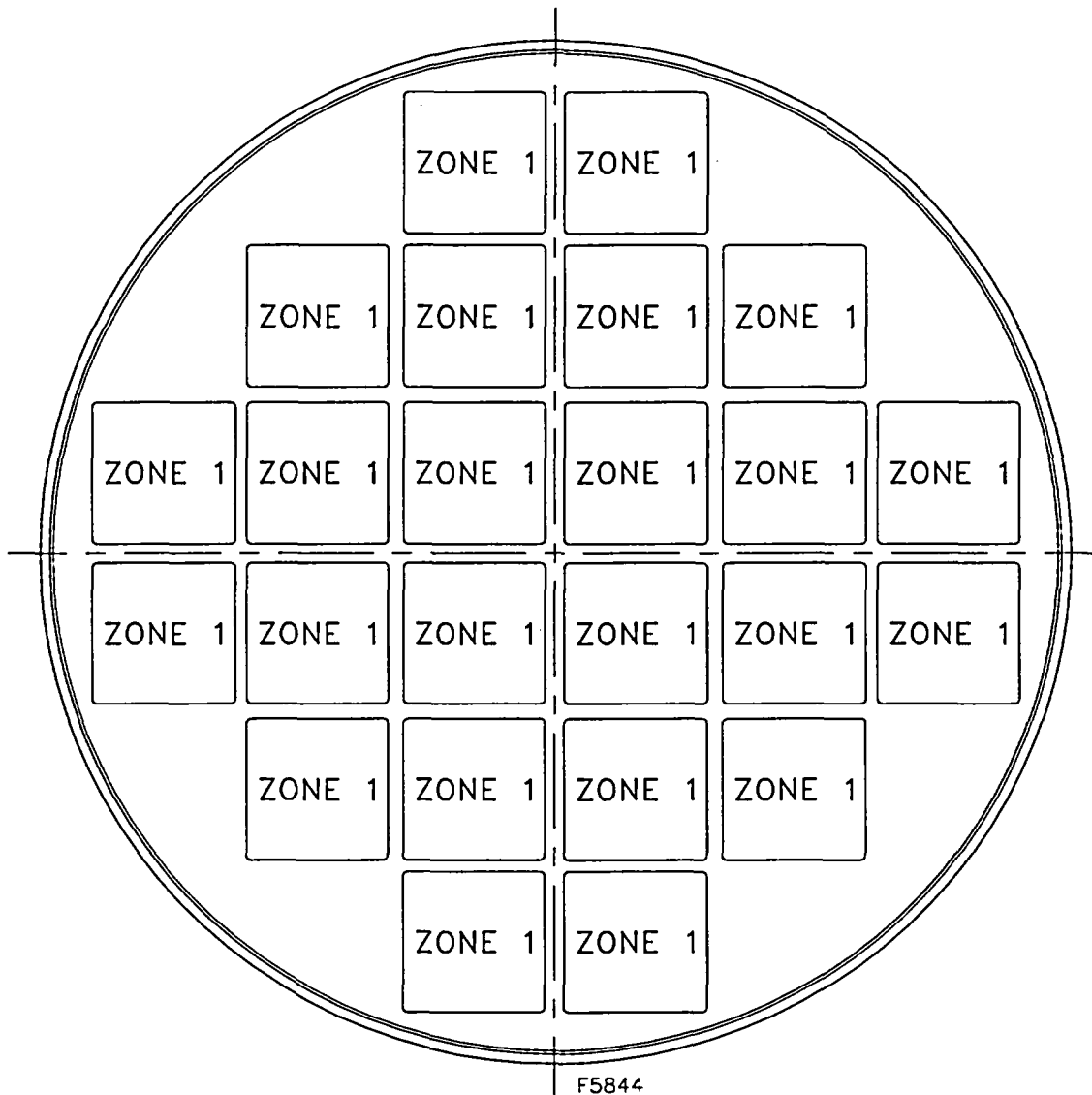
Figure 1-9
Heat Load Zoning Configuration for Fuel Assemblies (With or Without BPRAs)
Stored in NUHOMS®-24PHB DSC – Configuration 2



Linear Interpolation allowed between points

Initial Enrichment	Boron Loading, ppm
≤ 4.0	2350
4.1	2470
4.2	2580
4.3	2700
4.4	2790
4.5	2950

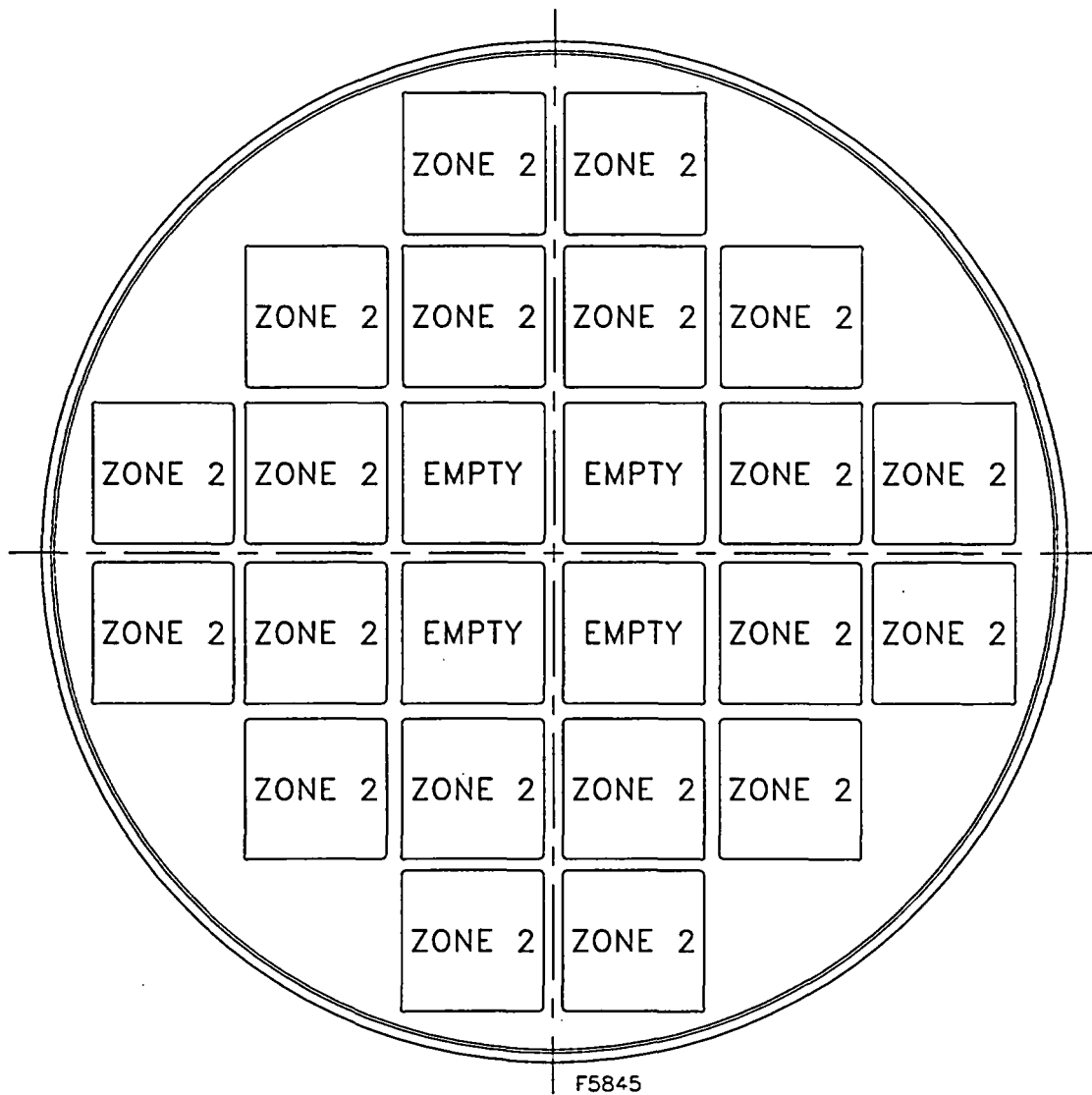
Figure 1-10
Soluble Boron Concentration vs. Fuel Initial U-235 Enrichment
for the 24PHB System



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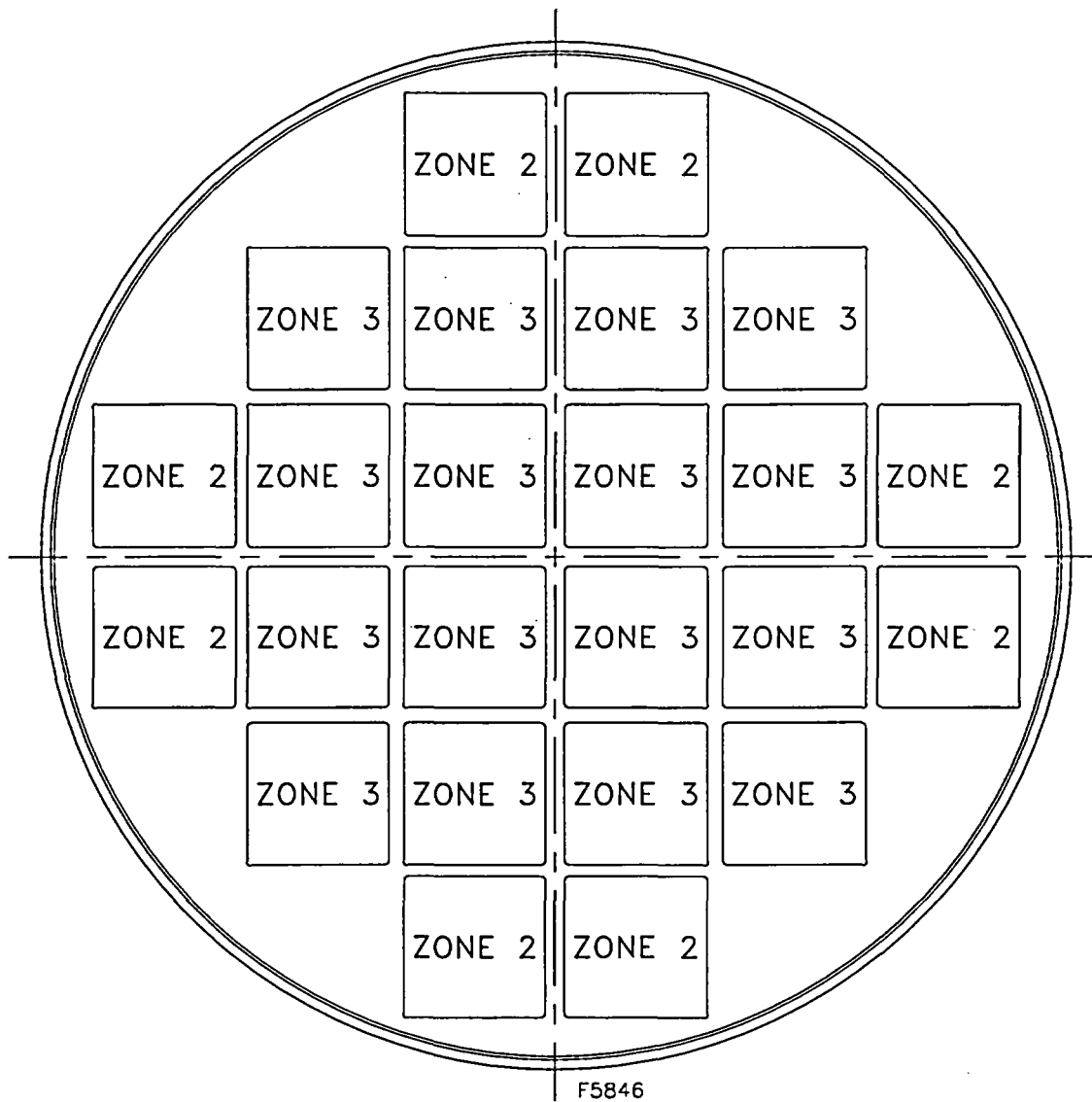
	Zone 1	Zone 2	Zone 3	Zone 4
Maximum Decay Heat (kW/FA)	1.7	NA	NA	NA
Maximum Decay Heat per Zone (kW)	40.8	NA	NA	NA

Figure 1-11
Heat Load Zoning Configuration No. 1 for 24PTH-S and 24PTH-L DSCs (with or without Control Components)



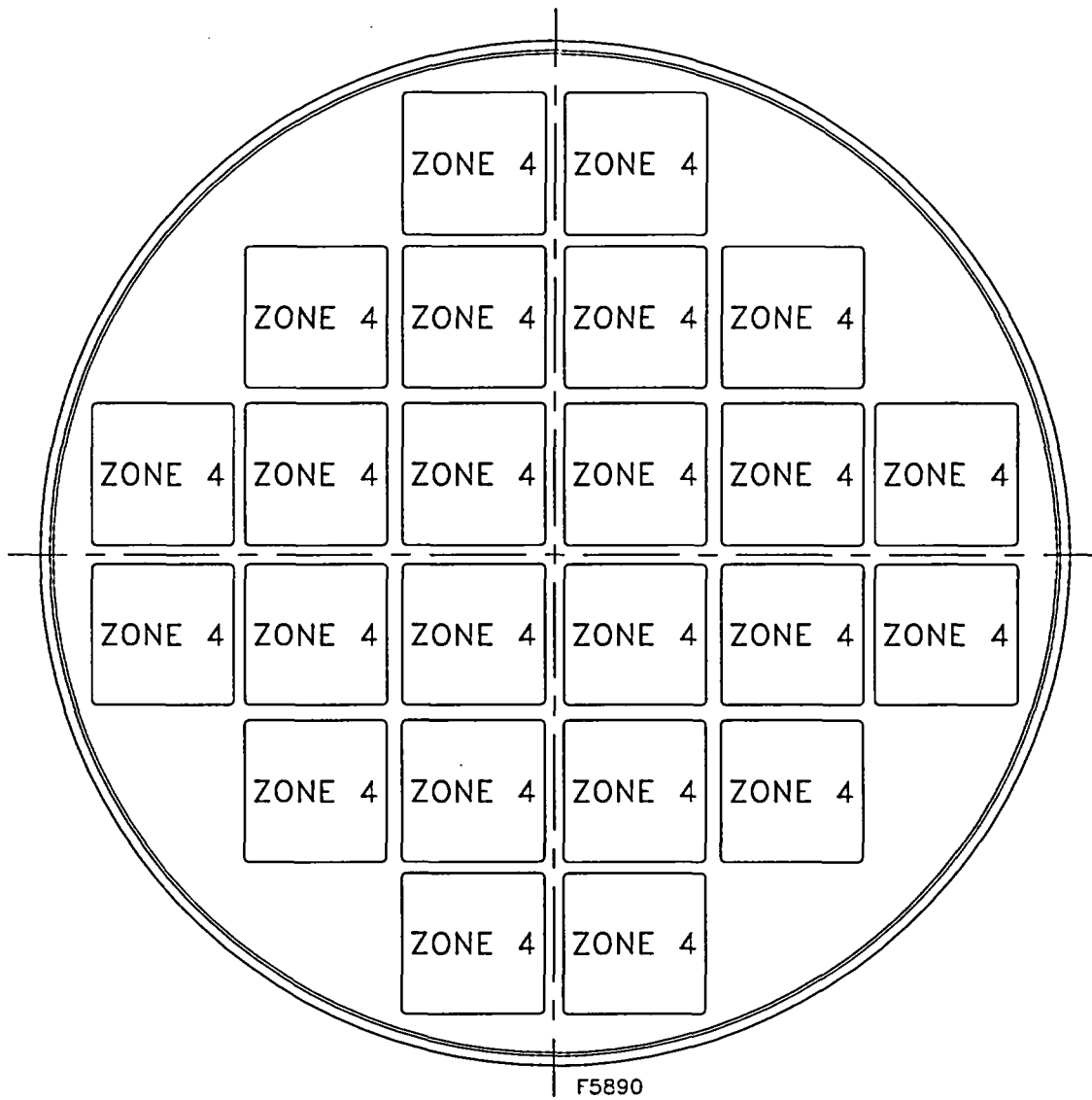
	Zone 1	Zone 2	Zone 3	Zone 4
Maximum Decay Heat (kW/FA)	NA	2.0	NA	NA
Maximum Decay Heat per Zone (kW)	NA	40.0	NA	NA

Figure 1-12
Heat Load Zoning Configuration No. 2 for 24PTH-S and 24PTH-L DSCs (with or without Control Components)



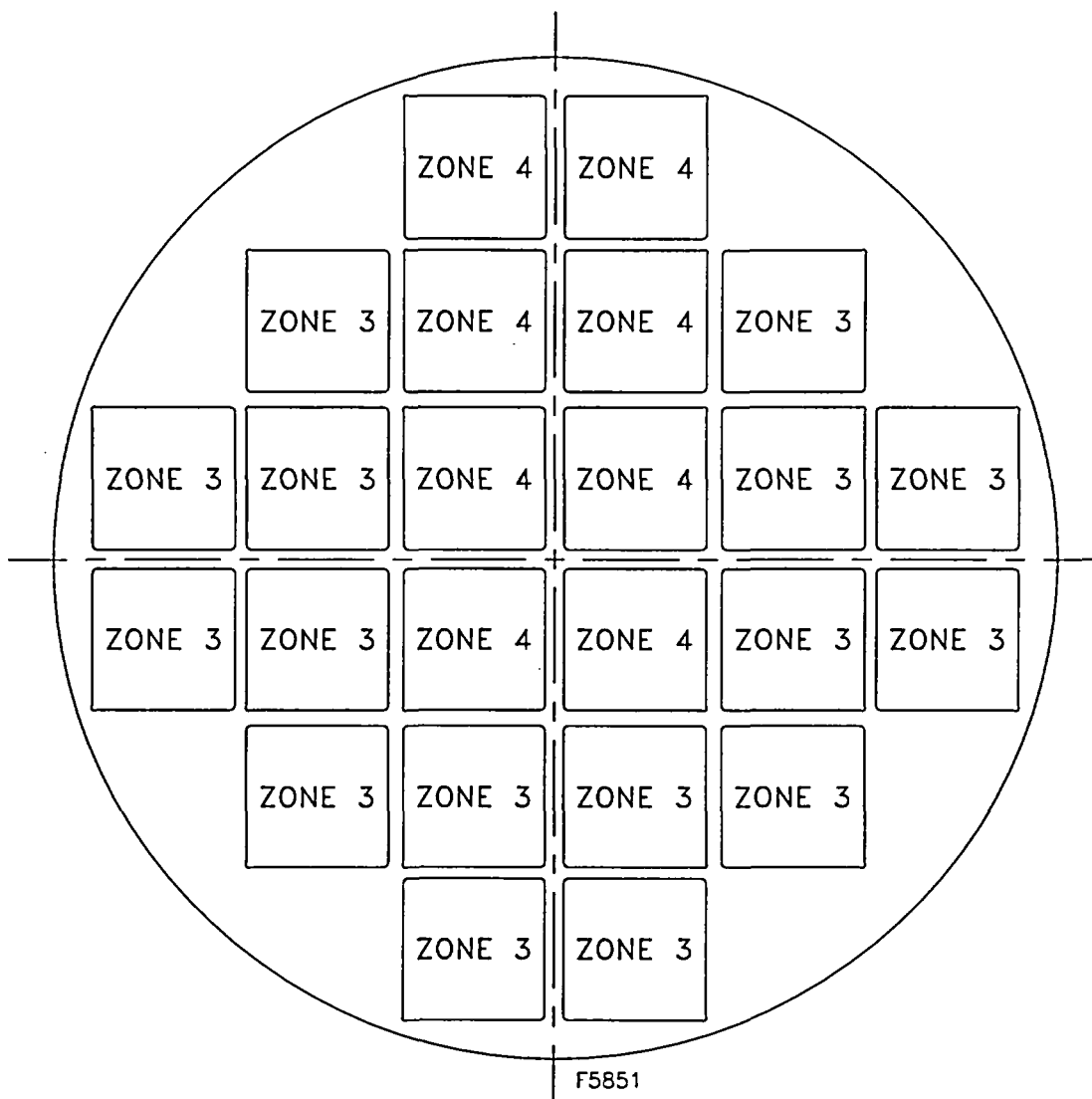
	Zone 1	Zone 2	Zone 3	Zone 4
Maximum Decay Heat (kW/FA)	NA	2.0	1.5	NA
Maximum Decay Heat per Zone (kW)	NA	16	24	NA

Figure 1-13
Heat Load Zoning Configuration No. 3 for 24PTH-S and 24PTH-L DSCs (with or without Control Components)



	Zone 1	Zone 2	Zone 3	Zone 4
Maximum Decay Heat (kW/FA)	NA	NA	NA	1.3
Maximum Decay Heat per Zone (kW)	NA	NA	NA	31.2

Figure 1-14
Heat Load Zoning Configuration No. 4 for 24PTH-S and 24PTH-L DSCs (with or without Control Components)

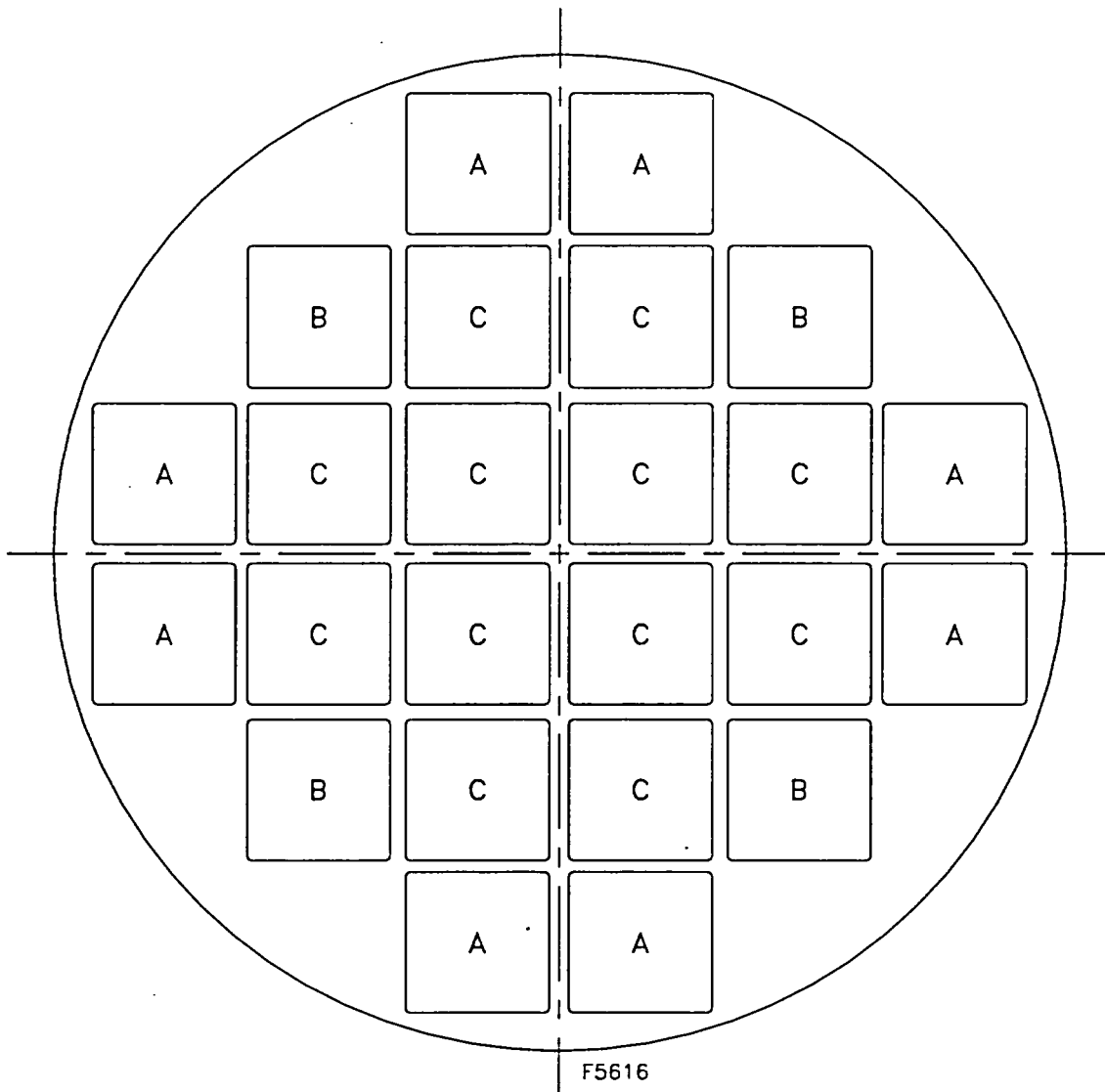


	Zone 1	Zone 2	Zone 3	Zone 4
Maximum Decay Heat (kW/FA)	NA	NA	1.5	1.3
Maximum Decay Heat per Zone (kW)	NA	NA	Note 1	10.4

Notes:

1. Fuel assemblies with a maximum heat load of 1.5 kW are permitted in Zone 3 as long as the total of 24 kW/canister maximum heat load is maintained.
2. This configuration is applicable to Basket Types 2A, 2B, or 2C only (without aluminum inserts).

Figure 1-15
Heat Load Zoning Configuration No. 5 for 24PTH-S-LC DSC (with or without Control Components)



Notes:

1. Locations identified as "A" are for placement of up to 8 damaged or intact fuel assemblies.
2. Locations identified as "B" are for placement of up to 4 additional damaged or intact fuel assemblies (Maximum of 12 damaged fuel assemblies allowed, Locations "A" and "B" combined).
3. Locations identified as "C" are for placement of up to 12 intact fuel assemblies, including 4 empty slots in the center as shown in Figure 1-12.

Figure 1-16
Location of Damaged Fuel Inside 24PTH DSC

1.2.2 DSC Vacuum Pressure During Drying

Limit/Specification:

Vacuum Pressure: ≤ 3 mm Hg

Time at Pressure: ≥ 30 minutes following stepped evacuation

Number of Pump-Downs: 2

Applicability: This is applicable to all DSCs.

Objective: To ensure a minimum water content.

Action: If the required vacuum pressure cannot be obtained:

1. Confirm that the vacuum drying system is properly installed.
2. Check and repair, or replace, the vacuum pump.
3. Check and repair the system as necessary.
4. Check and repair the seal weld between the inner top cover plate and the DSC shell.

Surveillance: No maintenance or tests are required during normal storage. Surveillance of the vacuum gauge is required during the vacuum drying operation.

Bases: A stable vacuum pressure of ≤ 3 mm Hg further ensures that all liquid water has evaporated in the DSC cavity, and that the resulting inventory of oxidizing gases in the DSC is well below the 0.25 volume %.

1.2.3 24P and 52B DSC Helium Backfill Pressure

Limit/Specifications:

Helium 2.5 psig \pm 2.5 psig backfill pressure (stable for 30 minutes after filling).

Applicability: This specification is applicable to 24P and 52B DSCs only.

Objective: To ensure that: (1) the atmosphere surrounding the irradiated fuel is a non-oxidizing inert gas; (2) the atmosphere is favorable for the transfer of decay heat.

Action: If the required pressure cannot be obtained:

1. Confirm that the vacuum drying system and helium source are properly installed.
2. Check and repair or replace the pressure gauge.
3. Check and repair or replace the vacuum drying system.
4. Check and repair or replace the helium source.
5. Check and repair the seal weld between the inner top cover and the DSC shell.

If pressure exceeds the criterion, release a sufficient quantity of helium to lower the DSC cavity pressure.

Surveillance: No maintenance or tests are required during the normal storage. Surveillance of the pressure gauge is required during the helium backfilling operation.

Bases: The value of 2.5 psig was selected to ensure that the pressure within the DSC is within the design limits during any expected normal and off-normal operating conditions.

1.2.3a 61BT, 32PT, 24PHB and 24PTH DSC Helium Backfill Pressure

Limit/Specifications:

Helium 2.5 psig \pm 1.0 psig backfill pressure (stable for 30 minutes after filling).

Applicability:

This specification is applicable to 61BT, 32PT, 24PHB and 24PTH DSC only.

Objective:

To ensure that: (1) the atmosphere surrounding the irradiated fuel is a non-oxidizing inert gas; (2) the atmosphere is favorable for the transfer of decay heat.

Action:

If the required pressure cannot be obtained:

1. Confirm that the vacuum drying system and helium source are properly installed.
2. Check and repair or replace the pressure gauge.
3. Check and repair or replace the vacuum drying system.
4. Check and repair or replace the helium source.
5. Check and repair the seal weld between the inner top cover and the DSC shell.

If pressure exceeds the criterion, release a sufficient quantity of helium to lower the DSC cavity pressure.

Surveillance:

No maintenance or tests are required during the normal storage. Surveillance of the pressure gauge is required during the helium backfilling operation.

Bases:

The value of 2.5 psig was selected to ensure that the pressure within the DSC is within the design limits during any expected normal and off-normal operating conditions.

1.2.4 24P and 52B DSC Helium Leak Rate of Inner Seal Weld

Limit/Specification:

$\leq 1.0 \times 10^{-4}$ atm · cubic centimeters per second (atm · cm³/s) at the highest DSC limiting pressure.

Applicability: This specification is applicable to the inner top cover plate seal weld of the 24P and 52B DSCs only.

Objective:

1. To limit the total radioactive gases normally released by each canister to negligible levels. Should fission gases escape the fuel cladding, they will remain confined by the DSC confinement boundary.
2. To retain helium cover gases within the DSC and prevent oxygen from entering the DSC. The helium improves the heat dissipation characteristics of the DSC and prevents any oxidation of fuel cladding.

Action: If the leak rate test of the inner seal weld exceeds 1.0×10^{-4} (atm · cm³/s):

1. Check and repair the DSC drain and fill port fittings for leaks.
2. Check and repair the inner seal weld.
3. Check and repair the inner top cover plate for any surface indications resulting in leakage.

Surveillance: After the welding operation has been completed, perform a leak test with a helium leak detection device.

Bases: If the DSC leaked at the maximum acceptable rate of 1.0×10^{-4} atm · cm³/s for a period of 20 years, about 63,100 cc of helium would escape from the DSC. This is about 1% of the 6.3×10^6 cm³ of helium initially introduced in the DSC. This amount of leakage would have a negligible effect on the inert environment of the DSC cavity. (Reference: American National Standards Institute, ANSI N14.5-1987, For Radioactive Materials—Leakage Tests on Packages for Shipment," Appendix B3).

1.2.4a 61BT, 32PT, 24PHB and 24PTH DSC Helium Leak Rate of Inner Seal Weld

Limit/Specification:

$\leq 1.0 \times 10^{-7}$ reference cubic centimeters per second (cc/s).

Applicability: This specification is applicable to the inner top cover plate seal weld of 61BT, 32PT 24PHB and 24PTH DSC only.

Objective:

1. To demonstrate that the top cover plate to be “leak tight”, as defined in “American National Standard for Leakage Tests on Packages for Shipment of Radioactive Materials,” ANSI N14.5 – 1997..
2. To retain helium cover gases within the DSC and prevent oxygen from entering the DSC. The helium improves the heat dissipation characteristics of the DSC and prevents any oxidation of fuel cladding.

Action: If the leak rate test of the inner seal weld exceeds 1.0×10^{-7} reference cc/s:

1. Check and repair the inner seal weld.
2. Check and repair the inner top cover plate for any surface indications resulting in leakage.

Surveillance: After the welding operation has been completed, perform a leak test with a helium leak detection device.

Bases: The 61BT, 32PT, 24PHB and 24PTH DSC will maintain an inert atmosphere around the fuel and radiological consequences will be negligible, since it is designed and tested to be leak tight.

1.2.5 DSC Dye Penetrant Test of Closure Welds

Limit/Specification:

All DSC closure welds except those subjected to full volumetric inspection shall be dye penetrant tested in accordance with the requirements of the ASME Boiler and Pressure Vessel Code Section III, Division 1, Article NB-5000. The liquid penetrant test acceptance standards shall be those described in Subsection NB-5350 of the Code.

Applicability: This is applicable to all DSCs. The welds include inner and outer top and bottom covers, and vent and siphon port covers.

Objective: To ensure that the DSC is adequately sealed in a redundant manner and leak tight.

Action: If the liquid penetrant test indicates that the weld is unacceptable:

1. The weld shall be repaired in accordance with approved ASME procedures.
2. The new weld shall be re-examined in accordance with this specification.

Surveillance: During DSC closure operations. No additional surveillance is required for this operation.

Bases: Article NB-5000 Examination, ASME Boiler and Pressure Vessel Code, Section III, Division 1, Sub-Section NB.

1.2.6 Deleted

1.2.7 HSM Dose Rates with a Loaded 24P, 52B or 61BT DSC

Limit/Specification:

Dose rates at the following locations shall be limited to levels which are less than or equal to:

- a. 400 mrem/hr at 3 feet from the HSM surface.
- b. Outside of HSM door on center line of DSC 100 mrem/hr.
- c. End shield wall exterior 20 mrem/hr.

Applicability: This specification is applicable to all HSMs which contain a loaded 24P, 52B or 61BT DSC.

Objective: The dose rate is limited to this value to ensure that the cask (DSC) has not been inadvertently loaded with fuel not meeting the specifications in Section 1.2.1 and to maintain dose rates as-low-as-is-reasonably achievable (ALARA) at locations on the HSMs where surveillance is performed, and to reduce off-site exposures during storage.

Action:

- a. If specified dose rates are exceeded, the following actions should be taken:
 - 1. Ensure that the DSC is properly positioned on the support rails.
 - 2. Ensure proper installation of the HSM door.
 - 3. Ensure that the required module spacing is maintained.
 - 4. Confirm that the spent fuel assemblies contained in the DSC conform to the specifications of Section 1.2.1.
 - 5. Install temporary or permanent shielding to mitigate the dose to acceptable levels in accordance with 10 CFR Part 20, 10 CFR 72.104(a), and ALARA.
- b. Submit a letter report to the NRC within 30 days summarizing the action taken and the results of the surveillance, investigation and findings. The report must be submitted using instructions in 10 CFR 72.4 with a copy sent to the administrator of the appropriate NRC regional office.

Surveillance: The HSM and ISFSI shall be checked to verify that this specification has been met after the DSC is placed into storage and the HSM door is closed.

Basis: The basis for this limit is the shielding analysis presented in Section 7.0, Appendix J, and Appendix K of the FSAR. The specified dose rates provide as-low-as-is-reasonably-achievable on-site and off-site doses in accordance with 10 CFR Part 20 and 10 CFR 72.104(a).

1.2.7a HSM Dose Rates with a Loaded 32PT DSC Only

Limit/Specification:

Dose rates at the following locations shall be limited to levels which are less than or equal to:

- a. 800 mrem/hr on the HSM front surface.
- b. 200 mrem/hr on the HSM door centerline.
- c. 8 mrem/hr on the end shield wall exterior.

Applicability:

This specification is applicable to all HSMs which contain a loaded 32PT DSC.

Objective:

The dose rate is limited to this value to ensure that the cask (DSC) has not been inadvertently loaded with fuel not meeting the specifications in Section 1.2.1 and to maintain dose rates as-low-as-is-reasonably achievable (ALARA) at locations on the HSMs where surveillance is performed, and to reduce off-site exposures during storage.

Action:

- a. If specified dose rates are exceeded, the following actions should be taken:
 - 1. Ensure that the DSC is properly positioned on the support rails.
 - 2. Ensure proper installation of the HSM door.
 - 3. Ensure that the required module spacing is maintained.
 - 4. Confirm that the spent fuel assemblies contained in the DSC conform to the specifications of Section 1.2.1.
 - 5. Install temporary or permanent shielding to mitigate the dose to acceptable levels in accordance with 10 CFR Part 20, 10 CFR 72.104(a), and ALARA.
- b. Submit a letter report to the NRC within 30 days summarizing the action taken and the results of the surveillance, investigation and findings. The report must be submitted using instructions in 10 CFR 72.4 with a copy sent to the administrator of the appropriate NRC regional office.

Surveillance:

The HSM and ISFSI shall be checked to verify that this specification has been met after the DSC is placed into storage and the HSM door is closed.

Basis:

The basis for this limit is the shielding analysis presented in Appendix M of the FSAR. The specified dose rates provide as-low-as-is-reasonably-achievable on-site and off-site doses in accordance with 10 CFR Part 20 and 10 CFR 72.104(a).

1.2.7b HSM Dose Rates with a Loaded 24PHB DSC Only

Limit/Specification:

Peak dose rates at the following locations shall be limited to levels which are less than or equal to:

- a. 500 mrem/hr on the HSM front surface.
- b. 20 mrem/hr on the HSM door centerline.
- c. 300 mrem/hr on the end shield wall exterior.

Applicability:

This specification is applicable to all HSMs which contain a loaded 24PHB DSC.

Objective:

The peak dose rate is limited to this value to ensure that the cask (DSC) has not been inadvertently loaded with fuel not meeting the specifications in Section 1.2.1 and to maintain dose rates as-low-as-is-reasonably achievable (ALARA) at locations on the HSMs where surveillance is performed, and to reduce off-site exposures during storage.

Action:

- a. If specified dose rates are exceeded, the following actions should be taken:
 - 1. Ensure that the DSC is properly positioned on the support rails.
 - 2. Ensure proper installation of the HSM door.
 - 3. Ensure that the required module spacing is maintained.
 - 4. Confirm that the spent fuel assemblies contained in the DSC conform to the specifications of Section 1.2.1.
 - 5. Install temporary or permanent shielding to mitigate the dose to acceptable levels in accordance with 10 CFR Part 20, 10 CFR 72.104(a), and ALARA.
- b. Submit a letter report to the NRC within 30 days summarizing the action taken and the results of the surveillance, investigation and findings. The report must be submitted using instructions in 10 CFR 72.4 with a copy sent to the administrator of the appropriate NRC regional office.

Surveillance:

The HSM and ISFSI shall be checked to verify that this specification has been met after the DSC is placed into storage and the HSM door is closed.

Basis:

The basis for this limit is the shielding analysis presented in Appendix N of the FSAR. The specified dose rates provide as-low-as-is-reasonably-achievable on-site and off-site doses in accordance with 10 CFR Part 20 and 10 CFR 72.104(a).

1.2.7c HSM-H Dose Rates with a Loaded 24PTH-S or 24PTH-L DSC Only

Limit/Specification:

Peak dose rates at the following locations shall be limited to levels which are less than or equal to:

- a. 1300 mrem/hr on the HSM-H front surface.
- b. 5 mrem/hr on the HSM-H door centerline.
- c. 10 mrem/hr on the end shield wall exterior.

Applicability:

This specification is applicable to all HSM-H modules which contain a loaded 24PTH-S or 24PTH-L DSC.

Objective:

The peak dose rate is limited to this value to ensure that the cask (DSC) has not been inadvertently loaded with fuel not meeting the specifications in Section 1.2.1 and to maintain dose rates as-low-as-is-reasonably achievable (ALARA) at locations on the HSM-H where surveillance is performed, and to reduce off-site exposures during storage.

Action:

- a. If specified dose rates are exceeded, the following actions should be taken:
 - 1. Ensure that the DSC is properly positioned on the support rails.
 - 2. Ensure proper installation of the HSM-H door.
 - 3. Confirm that the spent fuel assemblies contained in the DSC conform to the specifications of Section 1.2.1.
 - 4. Install temporary or permanent shielding to mitigate the dose to acceptable levels in accordance with 10 CFR Part 20, 10 CFR 72.104(a), and ALARA.
- b. Submit a letter report to the NRC within 30 days summarizing the action taken and the results of the surveillance, investigation and findings. The report must be submitted using instructions in 10 CFR 72.4 with a copy sent to the administrator of the appropriate NRC regional office.

Surveillance:

The HSM-H and ISFSI shall be checked to verify that this specification has been met after the DSC is placed into storage and the HSM-H door is closed.

Basis:

The basis for this limit is the shielding analysis presented in Appendix P of the FSAR. The specified dose rates provide as-low-as-is-reasonably-achievable on-site and off-site doses in accordance with 10 CFR Part 20 and 10 CFR 72.104(a).

1.2.7d HSM or HSM-H Dose Rates with a Loaded 24PTH-S-LC DSC Only

Limit/Specification:

Peak dose rates at the following locations shall be limited to levels which are less than or equal to:

- a. 500 mrem/hr on the HSM or HSM-H front surface.
- b. 70 mrem/hr on the HSM or HSM-H door centerline.
- c. 300 mrem/hr on the end shield wall exterior.

Applicability:

This specification is applicable to all HSMs or HSM-Hs which contain a loaded 24PTH-S-LC DSC.

Objective:

The peak dose rate is limited to this value to ensure that the cask (DSC) has not been inadvertently loaded with fuel not meeting the specifications in Section 1.2.1 and to maintain dose rates as-low-as-is-reasonably achievable (ALARA) at locations on the HSMs or HSM-Hs where surveillance is performed, and to reduce off-site exposures during storage.

Action:

- a. If specified dose rates are exceeded, the following actions should be taken:
 - 1. Ensure that the DSC is properly positioned on the support rails.
 - 2. Ensure proper installation of the HSM or HSM-H door.
 - 3. Confirm that the spent fuel assemblies contained in the DSC conform to the specifications of Section 1.2.1.
 - 4. Install temporary or permanent shielding to mitigate the dose to acceptable levels in accordance with 10 CFR Part 20, 10 CFR 72.104(a), and ALARA.
- b. Submit a letter report to the NRC within 30 days summarizing the action taken and the results of the surveillance, investigation and findings. The report must be submitted using instructions in 10 CFR 72.4 with a copy sent to the administrator of the appropriate NRC regional office.

Surveillance:

The HSM or HSM-H and ISFSI shall be checked to verify that this specification has been met after the DSC is placed into storage and the HSM or HSM-H door is closed.

Basis:

The basis for this limit is the shielding analysis presented in Appendix P of the FSAR. The specified dose rates provide as-low-as-is-reasonably-achievable on-site and off-site doses in accordance with 10 CFR Part 20 and 10 CFR 72.104(a).

1.2.8 HSM Maximum Air Exit Temperature with a Loaded 24P, 52B, 61BT, 32PT, 24PHB or 24PTH-S-LC Only

Limit/Specification:

Following initial DSC transfer to the HSM or the occurrence of accident conditions, the equilibrium air temperature difference between ambient temperature and the vent outlet temperature shall not exceed 100°F for ≥5 year cooled fuel, when fully loaded with 24 kW heat.

Applicability:

This specification is applicable to all HSMs stored in the ISFSI. If a DSC is placed in the HSM with a heat load less than 24 kW, the limiting difference between outlet and ambient temperatures shall be determined by a calculation performed by the user using the same methodology and inputs documents in the FSAR and SER.

Objective:

The objective of this limit is to ensure that the temperatures of the fuel cladding and the HSM concrete do not exceed the temperatures calculated in Section 8 of the FSAR. That section shows that if the air outlet temperature difference is less than or equal to 100°F (with a thermal heat load of 24 kW), the fuel cladding and concrete will be below the respective temperature limits for normal long-term operation.

Action:

If the temperature rise is greater than that specified, then the air inlets and exits should be checked for blockage. If the blockage is cleared and the temperature is still greater than that specified, the DSC and HSM cavity may be inspected using video equipment or other suitable means. If environmental factors can be ruled out as the cause of excessive temperatures, then the fuel bundles are producing heat at a rate higher than the upper limit specified in the Specification of Section 1.2.1 and will require additional measurements and analysis to assess the actual performance of the system. If excessive temperatures cause the system to perform in an unacceptable manner and/or the temperatures cannot be controlled to acceptable limits, then the cask shall be unloaded within the time period as determined by the analysis.

Surveillance:

The temperature rise shall be measured and recorded daily following DSC insertion until equilibrium temperature is reached, 24 hours after insertion, and again on a daily basis after insertion into the HSM or following the occurrence of accident conditions. If the temperature rise is within the specifications or the calculated value for a heat load less than 24 kW, then the HSM and DSC are performing as designed to meet this specification and no further maximum air exit temperature measurements are required. Air temperatures must be measured in such a manner as to obtain representative values of inlet and outlet air temperatures.

Basis:

The specified temperature rise is selected to ensure the fuel clad and concrete temperatures are maintained at or below acceptable long-term storage limits.

1.2.8a HSM-H Maximum Air Exit Temperature with a Loaded 24PTH DSC

Limit/Specification:

Following initial DSC transfer to the HSM-H or the occurrence of accident conditions, the equilibrium air temperature difference between ambient temperature and the vent outlet temperature shall not exceed 100°F when fully loaded with 40.8 kW heat for 24PTH-S or 24PTH-L DSC (or 70°F when fully loaded with 24PTH-S-LC DSC).

Applicability: This specification is applicable to all HSM-H modules stored in the ISFSI. If a DSC is placed in the HSM-H with a heat load less than 40.8 kW, the limiting difference between outlet and ambient temperatures shall be determined by a calculation performed by the user using the same methodology and inputs documents in Appendix P of the FSAR.

Objective: The objective of this limit is to ensure that the temperatures of the fuel cladding and the HSM-H concrete do not exceed the temperatures calculated in Appendix P of the FSAR. That section shows that if the air outlet temperature difference is less than or equal to 100°F with a thermal heat load of 40.8 kW for 24PTH-S or 24PTH-L DSC (or 70°F with a thermal heat load of 24.0 kW for 24PTH-S-LC), the fuel cladding and concrete will be below the respective temperature limits for normal long-term operation.

Action: If the temperature rise is greater than that specified, then the air inlets and exits should be checked for blockage. If the blockage is cleared and the temperature is still greater than that specified, the DSC and HSM-H cavity may be inspected using video equipment or other suitable means. If environmental factors can be ruled out as the cause of excessive temperatures, then the fuel bundles are producing heat at a rate higher than the upper limit specified in the specification of Section 1.2.1 and will require additional measurements and analysis to assess the actual performance of the system. If excessive temperatures cause the system to perform in an unacceptable manner and/or the temperatures cannot be controlled to acceptable limits, then the cask shall be unloaded within the time period as determined by the analysis.

Surveillance: The temperature rise shall be measured and recorded daily following DSC insertion until equilibrium temperature is reached, 24 hours after insertion, and again on a daily basis after insertion into the HSM-H or following the occurrence of accident conditions. If the temperature rise is within the specifications or the calculated value for a heat load less than 40.8 kW for 24PTH-S or 24PTH-L DSC (or 24.0 kW for 24PTH-S-LC DSC) then the HSM-H and DSC are performing as designed to meet this specification and no further maximum air exit temperature measurements are required. Air temperatures must be measured in such a manner as to obtain representative values of inlet and outlet air temperatures.

Basis: The specified temperature rise is selected to ensure the fuel clad and concrete temperatures are maintained at or below acceptable long-term storage limits.

1.2.9 Transfer Cask Alignment with HSM or HSM-H

Limit/Specification:

The cask must be aligned with respect to the HSM or HSM-H that the longitudinal centerline of the DSC in the transfer cask is within $\pm 1/8$ inch of its true position when the cask is docked with the HSM front access opening.

Applicability: This specification is applicable during the insertion and retrieval of all DSCs.

Objective: To ensure smooth transfer of the DSC from the transfer cask to HSM or HSM-H and back.

Action: If the alignment tolerance is exceeded, the following actions should be taken:

- a. Confirm that the transfer system is properly configured.
- b. Check and repair the alignment equipment.
- c. Confirm the locations of the alignment targets on the transfer cask and HSM or HSM-H.

Surveillance: Before initiating DSC insertion or retrieval, confirm the alignment. Observe the transfer system during DSC insertion or retrieval to ensure that motion or excessive vibration does not occur.

Basis: The basis for the true position alignment tolerance is the clearance between the DSC shell, the transfer cask cavity, the HSM or HSM-H access opening, and the DSC support rails inside the HSM or HSM-H.

1.2.10 DSC Handling Height Outside the Spent Fuel Pool Building

Limit/Specification:	<ol style="list-style-type: none">1. The loaded TC/DSC shall not be handled at a height greater than 80 inches outside the spent fuel pool building <i>where it is not being handled by methods that preclude its drop.</i>2. In the event of a drop of a loaded TC/DSC from a height greater than 15 inches: (a) fuel in the DSC shall be returned to the reactor spent fuel pool; (b) the DSC shall be removed from service and evaluated for further use; and (c) the TC shall be inspected for damage and evaluated for further use.
Applicability:	The specification applies to handling the TC, loaded with the DSC, on route to, and at, the storage pad.
Objective:	<ol style="list-style-type: none">1. To preclude a loaded TC/DSC drop from a height greater than 80 inches.2. To maintain spent fuel integrity, according to the spent fuel specification for storage, continued confinement integrity, and DSC functional capability, after a tip-over or drop of a loaded DSC from a height greater than 15 inches.
Surveillance:	In the event of a loaded TC/DSC drop accident, the system will be returned to the reactor fuel handling building, where, after the fuel has been returned to the spent fuel pool, the DSC and TC will be inspected and for future use.
Basis:	The NRC evaluation of the TC/DSC drop analysis concurred that drops up to 80 inches, of the DSC inside the TC, can be sustained without breaching the confinement boundary, preventing removal of spent fuel assemblies, or causing a criticality accident. This specification ensures that handling height limits will not be exceeded in transit to, or at the storage pad. Acceptable damage may occur to the TC, DSC, and the fuel stored in the DSC, for drops of height greater than 15 inches. The specification requiring inspection of the DSC and fuel following a drop of 15 inches or greater ensures that the spent fuel will continue to meet the requirements for storage, the DSC will continue to provide confinement, and the TC will continue to provide its design functions of DSC transfer and shielding.

1.2.11 Transfer Cask Dose Rates with a Loaded 24P, 52B, 61BT, or 32PT DSC

Limit/Specification:

Dose rates from the transfer cask shall be limited to levels which are less than or equal to:

- a. 200 mrem/hr at 3 feet with water in the DSC cavity.
- b. 500 mrem/hr at 3 feet without water in the DSC cavity.

Applicability:

This specification is applicable to the transfer cask containing a loaded 24P, 52B, 61BT, or 32PT DSC.

Objective:

The dose rate is limited to this value to ensure that the DSC has not been inadvertently loaded with fuel not meeting the specifications in Section 1.2.1 and to maintain dose rates as-low-as-is-reasonably achievable during DSC transfer operations.

Action:

If specified dose rates are exceeded, place temporary shielding around affected areas of transfer cask and review the plant records of the fuel assemblies which have been placed in DSC to ensure they conform to the fuel specifications of Section 1.2.1. Submit a letter report to the NRC within 30 days summarizing the action taken and the results of the surveillance, investigation and findings. The report must be submitted using instructions in 10 CFR 72.4 with a copy sent to the administrator of the appropriate NRC regional office.

Surveillance:

The dose rates should be measured as soon as possible after the transfer cask is removed from the spent fuel pool.

Basis:

The basis for this limit is the shielding analysis presented in Section 7.0, Appendix J, Appendix K and Appendix M of the FSAR.

1.2.11a Transfer Cask Dose Rates with a Loaded 24PHB DSC

Limit/Specification:

Dose rates from the transfer cask shall be limited to levels which are less than or equal to:

- a. 1700 mrem/hr at 3 feet from the top of the Cask at the cover plate edge with water in the DSC cavity.
- b. 500 mrem/hr at 3 feet radially from the Cask surface without water in the DSC cavity.

Applicability:

This specification is applicable to the transfer cask containing a loaded 24PHB DSC.

Objective:

The dose rate is limited to this value to ensure that the DSC has not been inadvertently loaded with fuel not meeting the specifications in Section 1.2.1 and to maintain dose rates as-low-as-is-reasonably achievable during DSC transfer operations.

Action:

If specified dose rates are exceeded, place temporary shielding around affected areas of transfer cask and review the plant records of the fuel assemblies which have been placed in DSC to ensure they conform to the fuel specifications of Section 1.2.1. Submit a letter report to the NRC within 30 days summarizing the action taken and the results of the surveillance, investigation and findings. The report must be submitted using instructions in 10 CFR 72.4 with a copy sent to the administrator of the appropriate NRC regional office.

Surveillance:

The dose rates should be measured as soon as possible after the transfer cask is removed from the spent fuel pool.

Basis:

The basis for this limit is the shielding analysis presented in Appendix N of the FSAR.

1.2.11b Transfer Cask Dose Rates with a Loaded 24PTH-S or 24PTH-L DSC

Limit/Specification:

Dose rates from the transfer cask shall be limited to levels which are less than or equal to:

- a. 500 mrem/hr at 3 feet from the top of the Cask at the cover plate edge with water in the DSC cavity.
- b. 600 mrem/hr at 3 feet radially from the Cask surface without water in the DSC cavity.

Applicability:

This specification is applicable to the transfer cask containing a loaded 24PTH-S or 24PTH-L DSC.

Objective:

The dose rate is limited to this value to ensure that the DSC has not been inadvertently loaded with fuel not meeting the specifications in Section 1.2.1 and to maintain dose rates as-low-as-is-reasonably achievable during DSC transfer operations.

Action:

If specified dose rates are exceeded, place temporary shielding around affected areas of transfer cask and review the plant records of the fuel assemblies which have been placed in DSC to ensure they conform to the fuel specifications of Section 1.2.1. Submit a letter report to the NRC within 30 days summarizing the action taken and the results of the surveillance, investigation and findings. The report must be submitted using instructions in 10 CFR 72.4 with a copy sent to the administrator of the appropriate NRC regional office.

Surveillance:

The dose rates should be measured as soon as possible after the transfer cask is removed from the spent fuel pool.

Basis:

The basis for this limit is the shielding analysis presented in Appendix P of the FSAR.

1.2.11c Transfer Cask Dose Rates with a Loaded 24PTH-S-LC DSC

Limit/Specification:

Dose rates from the transfer cask shall be limited to levels which are less than or equal to:

- a. 20 mrem/hr at 3 feet from the top of the Cask at the cover plate edge with water in the DSC cavity.
- b. 250 mrem/hr at 3 feet radially from the Cask surface without water in the DSC cavity.

Applicability:

This specification is applicable to the transfer cask containing a loaded 24PTH-S-LC DSC.

Objective:

The dose rate is limited to this value to ensure that the DSC has not been inadvertently loaded with fuel not meeting the specifications in Section 1.2.1 and to maintain dose rates as-low-as-is-reasonably achievable during DSC transfer operations.

Action:

If specified dose rates are exceeded, place temporary shielding around affected areas of transfer cask and review the plant records of the fuel assemblies which have been placed in DSC to ensure they conform to the fuel specifications of Section 1.2.1. Submit a letter report to the NRC within 30 days summarizing the action taken and the results of the surveillance, investigation and findings. The report must be submitted using instructions in 10 CFR 72.4 with a copy sent to the administrator of the appropriate NRC regional office.

Surveillance:

The dose rates should be measured as soon as possible after the transfer cask is removed from the spent fuel pool.

Basis:

The basis for this limit is the shielding analysis presented in Appendix P of the FSAR.

1.2.12 Maximum DSC Removable Surface Contamination

Limit/Specification:

2,200 dpm/100 cm² for beta-gamma sources
220 dpm/100 cm² for alpha sources.

Applicability: This specification is applicable to all DSCs.

Objective: To ensure that release of non-fixed contamination above accepted limits does not occur.

Action: If the required limits are not met:

- a. Flush the DSC/transfer cask annulus with demineralized water and/or scrub it using long handled tools. Repeat surface contamination surveys of the DSC upper surface.
- b. If contamination of the DSC cannot be reduced to an acceptable level by this means, direct surface cleaning techniques shall be used following removal of the fuel assemblies from the DSC and removal of the DSC from the transfer cask.
- c. Check and replace the DSC/transfer cask annulus seal to ensure proper installation and repeat canister loading process.

Surveillance: Following placement of each loaded DSC/transfer cask into the cask decontamination area, fuel pool water above the top shield plug shall be removed and the top region of the DSC and cask shall be decontaminated. A contamination survey of the upper 1 foot of the DSC shall be taken.

Basis: This non-fixed contamination level is consistent with the requirements of 10 CFR 71.87(i)(1) and 49 CFR 173.443, which regulate the use of spent fuel shipping containers. Consequently, these contamination levels are considered acceptable for exposure to the general environment. This level will also ensure that contamination levels of the inner surfaces of the HSM and potential releases of radioactive material to the environment are minimized.

1.2.13 TC/DSC Lifting Heights as a Function of Low Temperature and Location

- Limit/Specification:
1. No lifts or handling of the TC/DSC at any height are permissible at DSC basket temperatures below -20°F inside the spent fuel pool building.
 2. The maximum lift height of the TC/DSC shall be 80 inches if the basket temperature is below 0°F but higher than -20°F inside the spent fuel pool building.
 3. No lift height restriction is imposed on the TC/DSC if the basket temperature is higher than 0°F inside the spent fuel pool building.
 4. The maximum lift height and handling height for all transfer operations outside the spent fuel pool building shall be 80 inches (*when it is not being handled by methods that preclude its drop*) and the basket temperature may not be lower than 0°F.

Applicability: These temperature and height limits apply to lifting and transfer of all loaded TC/DSCs inside and outside the spent fuel pool building.

The requirements of 10 CFR Part 72 apply outside the spent fuel building. The requirements of 10 CFR Part 50 apply inside the spent fuel pool building.

Objective: The low temperature and height limits are imposed to ensure that brittle fracture of the ferritic steels, used in the TC trunnions and shell and in the DSC basket, does not occur during transfer operations.

Action: Confirm the basket temperature before transfer of the TC. If calculation or measurement of this value is available, then the ambient temperature may conservatively be used.

Surveillance: The ambient temperature shall be measured before transfer of the TC/DSC.

Bases: The basis for the low temperature and height limits is ANSI N14.6-1986 paragraph 4.2.6 which requires at least 40°F higher service temperature than nil ductility transition (NDT) temperature for the TC. In the case of the standardized TC, the test temperature is -40°F; therefore, although the NDT temperature is not determined, the material will have the required 40°F margin if the ambient temperature is 0°F or higher. This assumes the material service temperature is equal to the ambient temperature.

The basis for the low temperature limit for the DSC is NUREG/CR-1815. The basis for the handling height limits is the NRC evaluation of the structural integrity of the DSC to drop heights of 80 inches and less.

1.2.14 TC/DSC Transfer Operations at High Ambient Temperatures

- Limit/Specification:
1. The ambient temperature for transfer operations of a loaded TC/DSC shall not be greater than 100°F (when cask is exposed to direct insolation).
 2. For transfer operations when ambient temperatures exceed 100°F, a solar shield shall be used to provide protection against direct solar radiation.

Applicability: This ambient temperature limit applies to all transfer operations of loaded TC/DSCs outside the spent fuel pool building.

Objective: The high temperature limit (100°F) is imposed to ensure that:

1. The fuel cladding temperature limit is not exceeded,
2. The solid neutron shield material temperature limit is not exceeded, and
3. The corresponding TC cavity pressure limit is not exceeded.

Action: Confirm what the ambient temperature is and provide appropriate solar shade if ambient temperature is expected to exceed 100°F.

Surveillance: The ambient temperature shall be measured before transfer of the TC/DSC.

Bases: For the NUHOMS®-24P, 52B and 61BT systems, the basis for the high temperature limit is PNL-6189 (Reference 1) for the fuel clad limit, the manufacturer's specification for neutron shield, and the design basis pressure of the TC internal cavity pressure. For the NUHOMS®-32PT, 24PHB and 24PTH systems, the fuel cladding limits are based on ISG-11, Revision 2 (Reference 3).

1.2.15 Boron Concentration in the DSC Cavity Water for the 24-P Design Only

Limit/Specification:

The DSC cavity shall be filled only with water having a boron concentration equal to, or greater than:

- 1) 2,000 ppm for fuel with an equivalent unirradiated enrichment of less than or equal to 1.45 wt. % U-235 per Figure 1-1.
- 2) 2,350 ppm for fuel with an equivalent unirradiated enrichment of greater than 1.45 wt. % U-235 per Figure 1-1.

Applicability:

This limit applies only to the standardized NUHOMS®-24P design. No boration in the cavity water is required for the standardized NUHOMS®-52B or NUHOMS®-61BT system since that system uses fixed absorber plates.

Objective:

- 1) To ensure a subcritical configuration is maintained in the case of accidental loading of the DSC with unirradiated fuel.
- 2) To ensure a subcritical configuration is maintained in the case of loading of the DSC with fuel with an equivalent unirradiated enrichment of greater than 1.45 wt. % U-235.

Action:

If the boron concentration is below the required weight percentage concentration (gm boron/10⁶ gm water), add boron and re-sample, and test the concentration until the boron concentration is shown to be greater than that required.

Surveillance:

Written procedures shall be used to independently determine (two samples analyzed by different individuals) the boron concentration in the water used to fill the DSC cavity.

1. Within 24 hours before insertion of the first fuel assembly into the DSC, the dissolved boron concentration in water in the spent fuel pool, and in the water that will be introduced in the DSC cavity, shall be independently determined (two samples chemically analyzed by two individuals).
2. Within 24 hours before flooding the DSC cavity for unloading the fuel assemblies, the dissolved boron concentration in water in the spent fuel pool, and in the water that will be introduced into the DSC cavity, shall be independently determined (two samples analyzed chemically by two individuals).

3. The dissolved boron concentration in the water shall be reconfirmed at intervals not to exceed 48 hours until such time as the DSC is removed from the spent fuel pool or the fuel has been removed from the DSC.

Bases:

- 1) The required boron concentration is based on the criticality analysis for an accidental misloading of the DSC with unburned fuel, maximum enrichment, and optimum moderation conditions.
- 3) The required boron concentration is based on the criticality analysis for loading of the DSC with unirradiated fuel, maximum enrichment, and optimum moderation conditions.

1.2.15a Boron Concentration in the DSC Cavity Water for the 32PT Design Only

Limit/Specification:

The DSC cavity shall be filled only with water having a *minimum* boron concentration *per Table 1-1g*.

Applicability:

This limit applies only to the standardized NUHOMS® - 32PT design.

Objective:

To ensure a subcritical configuration is maintained in the case of loading of the DSC with design basis fuel.

Action:

If the boron concentration is below the required weight percentage concentration (gm boron/10⁶ gm water), add boron and re-sample, and test the concentration until the boron concentration is shown to be greater than that required.

Surveillance:

Written procedures shall be used to independently determine (two samples analyzed by different individuals) the boron concentration in the water used to fill the DSC cavity.

1. Within 24 hours before insertion of the first fuel assembly into the DSC, the dissolved boron concentration in water in the spent fuel pool, and in the water that will be introduced in the DSC cavity, shall be independently determined (two samples chemically analyzed by two individuals).
2. Within 24 hours before flooding the DSC cavity for unloading the fuel assemblies, the dissolved boron concentration in water in the spent pool, and in the water that will be introduced into the DSC cavity, shall be independently determined (two samples analyzed chemically by two individuals).
3. The dissolved boron concentration in the water shall be reconfirmed at intervals not to exceed 48 hours until such time as the DSC is removed from the spent fuel pool or the fuel has been removed from the DSC.

Bases:

The required boron concentration is based on the criticality analysis presented in Appendix M of this FSAR for loading of the DSC with unirradiated fuel, maximum enrichment, and optimum moderation conditions.

1.2.15b Boron Concentration in the DSC Cavity Water for the 24PHB Design Only

Limit/Specification:

- The DSC cavity shall be filled only with water having a boron concentration equal to, or greater than 2,350 ppm for enrichment of less than or equal to 4.0 wt. % U-235 based on the spent fuel assembly with the maximum initial enrichment in the DSC.
- The DSC cavity shall be filled only with water having a minimum boron concentration per Figure 1-10 for initial enrichment of greater than or equal to 4.0 wt. % U-235 based on the spent fuel assembly with the maximum initial enrichment in the DSC.

Applicability: This limit applies only to the standardized NUHOMS®-24PHB design.

Objective: To ensure a subcritical configuration is maintained in the case of accidental loading of the DSC with unirradiated fuel.

Action: If the boron concentration is below the required weight percentage concentration (gm boron/10⁶ gm water), add boron and re-sample, and test the concentration until the boron concentration is shown to be greater than that required.

Surveillance: Written procedures shall be used to independently determine (two samples analyzed by different individuals) the boron concentration in the water used to fill the DSC cavity.

1. Within 24 hours before insertion of the first fuel assembly into the DSC, the dissolved boron concentration in water in the spent fuel pool, and in the water that will be introduced in the DSC cavity, shall be independently determined (two samples chemically analyzed by two individuals).
2. Within 24 hours before flooding the DSC cavity for unloading the fuel assemblies, the dissolved boron concentration in water in the spent pool, and in the water that will be introduced into the DSC cavity, shall be independently determined (two samples analyzed chemically by two individuals).
3. The dissolved boron concentration in the water shall be reconfirmed at intervals not to exceed 48 hours until such time as the DSC is removed from the spent fuel pool or the fuel has been removed from the DSC.

Bases: The required boron concentration is based on the criticality analysis for loading of the DSC with unirradiated fuel, initial enrichment, and optimum moderation conditions.

1.2.15c Boron Concentration in the DSC Cavity Water for the 24PTH Design Only

Limit/Specification:

- The DSC cavity shall only be filled with water having a minimum boron concentration which meets the requirements of Table 1-1p, when loading intact fuel. Table 1-1p lists the minimum soluble boron concentration as a function of the fuel assembly class, DSC basket type and the corresponding assembly average initial enrichment values.
- The DSC cavity shall only be filled with water having a minimum boron concentration which meets the requirements of Table 1-1q, when loading damaged fuel. Table 1-1q lists the minimum soluble boron concentration as a function of the fuel assembly class, DSC basket type, the maximum number of damaged fuel assemblies allowed and the corresponding maximum assembly average initial enrichment values.

Applicability: This limit applies only to the NUHOMS®-24PTH design.

Objective: To ensure a subcritical configuration is maintained in the case of accidental loading of the DSC with unirradiated fuel.

Action: If the boron concentration is below the required weight percentage concentration (gm boron/10⁶ gm water), add boron and re-sample, and test the concentration until the boron concentration is shown to be greater than that required.

Surveillance: Written procedures shall be used to independently determine (two samples analyzed by different individuals) the boron concentration in the water used to fill the DSC cavity.

1. Within 24 hours before insertion of the first fuel assembly into the DSC, the dissolved boron concentration in water in the spent fuel pool, and in the water that will be introduced in the DSC cavity, shall be independently determined (two samples chemically analyzed by two individuals).
2. Within 24 hours before flooding the DSC cavity for unloading the fuel assemblies, the dissolved boron concentration in water in the spent pool, and in the water that will be introduced into the DSC cavity, shall be independently determined (two samples analyzed chemically by two individuals).
3. The dissolved boron concentration in the water shall be reconfirmed at intervals not to exceed 48 hours until such time as the DSC is removed from the spent fuel pool or the fuel has been removed from the DSC.

Bases: The required boron concentration is based on the criticality analysis in FSAR Appendix P for loading of the DSC with unirradiated fuel, initial enrichment, and optimum moderation conditions.

1.2.16 Provision of TC Seismic Restraint Inside the Spent Fuel Pool Building as a Function of Horizontal Acceleration and Loaded Cask Weight

Limit/Specification:

Seismic restraints shall be provided to prevent overturning of a loaded TC during a seismic event if a certificate holder determines that the horizontal acceleration is 0.40 g or greater. The determination of horizontal acceleration acting at the center of gravity (CG) of the loaded TC must be based on a peak horizontal ground acceleration at the site, but shall not exceed 0.25 g.

Applicability:

This condition applies to all TCs which are subject to horizontal accelerations of 0.40 g or greater.

Objective:

To prevent overturning of a loaded TC inside the spent fuel pool building.

Action:

Determine what the horizontal acceleration is for the TC and determine if the cask weight is less than 190 kips.

Surveillance:

Determine need for TC restraint before any operations inside the spent fuel pool building.

Bases:

Calculation of overturning and restoring moments.

1.2.17 61BT DSC Vacuum Drying Duration Limit

Limit/Specifications:

Time limit for duration of Vacuum Drying is 96 hours after completion of 61BT DSC draining.

Applicability: This specification is only applicable to a 61BT DSC with greater than 17.6 kW heat load.

Objective: To ensure that 61BT DSC basket structure does not exceed 800°F.

Action:

1. If the DSC vacuum drying pressure limit of Technical Specification 1.2.2 cannot be achieved at 72 hours after completion of DSC draining, the DSC must be backfilled with 0.1 atm or greater helium pressure within 24 hours.
2. Determine the cause of failure to achieve the vacuum drying pressure limit as defined in Technical Specification 1.2.2.
3. Initiate vacuum drying after actions in Step 2 are completed or unload the DSC within 30 days.

Surveillance: No maintenance or tests are required during the normal storage. Monitoring of the time duration during the vacuum drying operation is required .

Bases: The time limit of 96 hours was selected to ensure that the temperature within the DSC is within the design limits during vacuum drying.

1.2.17a 32PT DSC Vacuum Drying Duration Limit

Limit/Specifications:

1. The limit for duration of Vacuum Drying is 31 hrs for a 32PT DSC with a heat load greater than 8.4 kW and up to 24 kW after initiation of vacuum drying.
2. The limit for duration of Vacuum Drying is 36 hrs for a 32PT DSC with a heat load of up to 8.4 kW after initiation of vacuum drying.

Applicability: This specification is applicable to a 32PT DSC with heat load as described above.

Objective: To ensure the fuel cladding temperature in the 32PT DSC does not exceed 752°F during drying and also to meet the thermal cycling limit of 117°F during drying, helium backfilling and transfer operations.

Action:

1. If the DSC vacuum drying pressure limit of Technical Specification 1.2.2 cannot be achieved at the specified time limits after initiation of vacuum drying, the DSC must be backfilled with 0.1 atm or greater helium pressure within 2 hours.
2. Determine the cause of failure to achieve the vacuum drying pressure limit as defined in Technical Specification 1.2.2.
3. Initiate vacuum drying after actions in Step 2 are completed or unload the DSC within 30 days.

Surveillance: No maintenance or tests are required during the normal storage. Monitoring of the time duration during the vacuum drying operation is required.

Bases: The time limits for the 32PT DSC were selected to ensure that the maximum cladding temperature is within the acceptable limit of 752°F during vacuum drying. These time limits also ensure that the cladding temperature meets the thermal cycling criteria of 117°F during drying, helium backfilling and transfer operations.

1.2.17b 24PHB DSC Vacuum Drying Duration Limit

Limit/Specifications:

1. The limit for duration of Vacuum Drying is 29 hrs for a 24PHB DSC with a heat load greater than 12.0 kW and up to 24 kW after initiation of vacuum drying.
2. The limit for duration of Vacuum Drying is 32 hrs for a 24PHB DSC with a heat load of up to 12.0 kW after initiation of vacuum drying.

Applicability: This specification is applicable to a 24PHB DSC with heat load as described above.

Objective: To ensure the fuel cladding temperature in the 24PHB DSC does not exceed 752°F during drying and also to meet the thermal cycling limit of 117°F during drying, helium backfilling and transfer operations.

Action:

1. If the DSC vacuum drying pressure limit of Technical Specification 1.2.2 cannot be achieved at the specified time limits after initiation of vacuum drying, the DSC must be backfilled with 0.1 atm or greater helium pressure within 2 hours.
2. Determine the cause of failure to achieve the vacuum drying pressure limit as defined in Technical Specification 1.2.2.
3. Initiate vacuum drying after actions in Step 2 are completed or unload the DSC within 30 days.

Surveillance: No maintenance or tests are required during the normal storage. Monitoring of the time duration during the vacuum drying operation is required.

Bases: The time limit for the 24PHB DSC were selected to ensure that the maximum cladding temperature is within the acceptable limits of 752°F during vacuum drying. These time limits also ensure that the cladding temperature meets the thermal cycling criteria of 117°F during drying, helium backfilling and transfer operations.

1.2.17c 24PTH DSC Vacuum Drying Duration Limit

Limit/Specifications:

1. The time duration of Vacuum Drying for a 24PTH DSC following blowdown completion using air or nitrogen shall be less than or equal to:
 - 17 hours for Heat Load Configuration No.1, 2 and 3
 - 23 hours for Heat Load Configuration No. 4
 - 26 hours for Heat Load Configuration No. 5
2. No time limits apply for vacuum drying of 24PTH DSC if helium is used for blowdown.

Applicability: This specification is applicable to a 24PTH DSC with heat load configuration following blowdown using air or nitrogen as described above.

Objective: To ensure the fuel cladding temperature in the 24PTH DSC does not exceed 752°F during drying and also to meet the thermal cycling limit of 117°F during drying, helium backfilling and transfer operations.

Action:

1. If the DSC vacuum drying pressure limit of Technical Specification 1.2.2 cannot be achieved at the specified time limits after initiation of vacuum drying, the DSC must be backfilled with 0.1 atm or greater helium pressure within 2 hours.
2. Determine the cause of failure to achieve the vacuum drying pressure limit as defined in Technical Specification 1.2.2.
3. Initiate vacuum drying after actions in Step 2 are completed or unload the DSC within 30 days.

Surveillance: No maintenance or tests are required during the normal storage. Monitoring of the time duration during the vacuum drying operation is required.

Bases: The time limit for the 24PTH DSC were selected to ensure that the maximum cladding temperature is within the acceptable limits of 752°F during vacuum drying. These time limits also ensure that the cladding temperature meets the thermal cycling criteria of 117°F during drying, helium backfilling and transfer operations.

1.2.18 Time Limit for Completion of 24PTH DSC Transfer Operation

Limit Specification:

The time limit for completion of transfer of a loaded and welded 24PTH DSC with a heat load greater than 24.0 kW from the cask handling area to the HSM-H is dependent on the heat load as follows:

- 9.5 hours for a DSC with a heat load greater than 31.2 kW but less than or equal to 40.8 kW with basket types 1A, 1B or 1C.
- 25 hours for a DSC with a heat load greater than 24.0 kW but less than or equal to 31.2 kW with a basket type 2A, 2B or 2C (without aluminum inserts).
- No time limits apply for a 24PTH DSC with a heat load greater than 24.0 kW but less than or equal to 31.2 kW, with a basket type 1A, 1B, or 1C (with aluminum inserts).

Applicability: This specification is only applicable to a 24PTH-S or 24PTH-L DSC when transferred in OS197FC cask with heat loads greater than 24.0 kW. The time limit is defined as the time elapsed after the initiation of draining of Cask/DSC annulus water and bolting of the transfer cask top cover plate until it is unbolted for insertion of the DSC into the HSM-H.

Objective: To ensure that the fuel cladding temperatures in the 24PTH DSC do not exceed 752°F during transfer operations.

Actions: Initiate one of the following corrective actions within two hours if specified time limits are exceeded.

1. Complete the transfer of the DSC from the transfer cask to the HSM-H, or
2. If the transfer cask is in the cask handling area in a vertical orientation, unbolt the cask top cover plate and fill the cask/DSC annulus with clean water, or
3. If the cask is in a horizontal orientation on the transfer skid, then initiate air circulation in the Cask/DSC annulus by starting one of the blowers provided on the cask transfer skid, or
4. Initiate appropriate external cooling of the cask outer surface by other means to limit the temperature increase or return the cask to the cask handling area, unbolt the cask top cover plate and fill the cask/DSC annulus with clean water.

Surveillance: Monitoring of the time duration following the completion of the DSC sealing until the completion of unbolting of the transfer cask top plate is required.

Bases:

The required time limit is based on the transient thermal analysis presented in Appendix P of the FSAR for the transfer of the 24PTH DSC.

1.3 Surveillance and Monitoring

One of the two alternate surveillance activities listed below (1.3.1 or 1.3.2) shall be performed for monitoring the HSM or HSM-H thermal performance.

1.3.1 Visual Inspection of HSM or HSM-H Air Inlets and Outlets (Front Wall and Roof Birdscreen)

Limit/Surveillance:

A visual surveillance of the exterior of the air inlets and outlets shall be conducted daily. In addition, a close-up inspection shall be performed to ensure that no materials accumulate between the modules to block the air flow.

Objective:

To ensure that HSM or HSM-H air inlets and outlets are not blocked for more than 40 hours to prevent exceeding the allowable HSM or HSM-H concrete and or the fuel cladding temperatures.

Applicability:

This specification is applicable to all HSMs or HSM-Hs loaded with a DSC loaded with spent fuel.

Action:

If the surveillance shows blockage of air vents (inlets or outlets), they shall be cleared. If the screen is damaged, it shall be replaced.

Basis:

The concrete temperature could exceed 350°F in the accident circumstances of complete blockage of all vents if the period exceeds approximately 40 hours for HSM. Concrete temperatures over 350°F in accidents (without the presence of water or steam) can have uncertain impact on concrete strength and durability. A conservative analysis (adiabatic heat case) of complete blockage of all air inlets or outlets indicates that the concrete can reach the accident temperature limit of 350°F in the time periods specified for HSM. For HSM-H, the time period specified ensures that blockage will not exist for periods longer than that assumed in the Safety analysis presented in Appendix P of the FSAR. At the 40 hour time limit, the fuel cladding temperature remains well below the accident limit of 1058°F.

1.3.2 HSM or HSM-H Thermal Performance

- Surveillance:** Verify a temperature measurement of the thermal performance, for each HSM or HSM-H, on a daily basis. The temperature measurement could be any parameter such as (1) a direct measurement of the HSM or HSM-H temperatures, (2) a direct measurement of the DSC temperatures, (3) a comparison of the inlet and outlet temperature difference to predicted temperature differences for each individual HSM or HSM-H, or (4) other means that would identify and allow for the correction of off-normal thermal conditions that could lead to exceeding the concrete and fuel clad temperature criteria. If air temperatures are measured, they must be measured in such a manner as to obtain representative values of inlet and outlet air temperatures. Also due to the proximity of adjacent HSM or HSM-H modules, care must be exercised to ensure that measured air temperatures reflect only the thermal performance of an individual module, and not the combined performance of adjacent modules.
- Action:** If the temperature measurement shows a significant unexplained difference, so as to indicate the approach of materials to the concrete or fuel clad temperature criteria, take appropriate action to determine the cause and return the canister to normal operation. If the measurement or other evidence suggests that the concrete accident temperature criteria (350°F) has been exceeded for more than 24 hours, the HSM or HSM-H must be removed from service unless the licensee can provide test results in accordance with ACI-349, appendix A.4.3, demonstrating that the structural strength of the HSM or HSM-H has an adequate margin of safety.
- Basis:** The temperature measurement should be of sufficient scope to provide the licensee with a positive means to identify conditions which threaten to approach temperature criteria for proper HSM or HSM-H operation and allow for the correction of off-normal thermal conditions that could lead to exceeding the concrete and fuel clad temperature criteria.

Table 1.3.1
Summary of Surveillance and Monitoring Requirements

Surveillance or Monitoring	Period	Reference Section
1. Fuel Specification	PL	1.2.1
2. DSC Vacuum Pressure During Drying	L	1.2.2
3. DSC Helium Backfill Pressure	L	1.2.3 or 1.2.3a
4. DSC Helium Leak Rate of Inner Seal Weld	L	1.2.4 or 1.2.4a
5. DSC Dye Penetrant Test of Closure Welds	L	1.2.5
6. DELETED	-	-
7. HSM or HSM-H Dose Rates	L	1.2.7 or 1.2.7a, or 1.2.7b or 1.2.7c or 1.2.7d
8. HSM or HSM-H Maximum Air Exit Temperature	24 hrs	1.2.8 or 1.2.8a
9. TC Alignment with HSM or HSM-H	S	1.2.9
10. DSC Handling Height Outside Spent Fuel Pool Building	AN	1.2.10
11. Transfer Cask Dose Rates	L	1.2.11 or 1.2.11a or 1.2.11b or 1.2.11c
12. Maximum DSC Removable Surface Contamination	L	1.2.12
13. TC/DSC Lifting Heights as a Function of Low Temperature and Location	L	1.2.13
14. TC/DSC Transfer Operations at High Ambient Temperatures	L	1.2.14
15. Boron Concentration in DSC Cavity Water	PL	1.2.15, or 1.2.15a, or 1.2.15b or 1.2.15c
16. Provision of TC Seismic Restraint Inside the Spent Fuel Pool Building as a Function of Horizontal Acceleration and Loaded Cask Weight	PL	1.2.16
17. Vacuum Drying Duration Limits	L	1.2.17 or 1.2.17a, or 1.2.17b, or 1.2.17c
18. 24PTH DSC Transfer Time	L	1.2.18
19. Visual Inspection of HSM or HSM-H Air Inlets and Outlets or HSM or HSM-H Thermal Performance	D	1.3.1 or 1.3.2

LEGEND

PL..... Prior to Loading

L..... During loading and prior to movement to HSM or HSM-H pad

24 hrs..... Time following DSC insertion to HSM or HSM-H

S Prior to movement of DSC to or from HSM or HSM-H

AN..... As necessary

D..... Daily (24 hour frequency)

References

1. Levy, I.S., et al., "Recommended Temperature Limits for Dry Storage of Spent Light Water Reactor Zircaloy-Clad Fuel Rods in Inert Gas," Pacific Northwest Laboratory Report, PNL-6189, May 1987.
2. Johnson, A.B., Jr., and E.R. Gilbert, "Technical Basis for Storage of Zircaloy-Clad Spent Fuel in Inert Gases," PNL-4835, September 1983.
3. Interim Staff guidance No. 11, Revision 2, "Cladding Considerations for the Transportation and Storage of Spent Fuel," July 30, 2002.

ATTACHMENT C-1

Updated FSAR Revision 7 Changed Pages

Revisions indicated relative to Updated FSAR, Revision 7. Listed below are the affected FSAR Appendix M pages:

- M.2-3
- M.2-13 thru M.2-15
- M.2-17 thru M.2-21
- M.5-1 thru M.5-2
- M.5-4 thru M.5-8
- M.5-8a thru M.5-58c (New)
- M.5-89a (New)
- M.5-90 thru M.5-99
- M.5-99a thru M.5-99g (New)
- M.6-2
- M.6-4
- M.6-4a (New)
- M.6-8 thru M.6-9
- M.6-10a (New)
- M.6-11
- M.6-11a (New)
- M.6-12
- M.6-30
- M.6-32
- M.6-34
- M.6-42 thru M.6-46
- M.6-46a (New)
- M.6-47 thru M.6-48
- M.6-48a thru M.6-48d (New)
- M.6-49
- M.6-49a thru M.6-49c (New)
- M.6-50
- M.6-56a thru M.6-56nn (New)

g/cm². The criticality analysis is based on 90% credit or 0.0063 g/cm² of B10. The use of 90% credit is allowed because poison material coupons are to be tested via neutron transmission plus statistical analysis of the neutron transmission results. A basket may contain 0, 4, 8, or 16 PRAs and is designated a Type A, Type B, Type C or Type D basket, respectively.

Reconstituted fuel assemblies with up to 56 solid stainless steel rods or unlimited number of lower environment UO₂ rods that replace fuel rods are acceptable for the 32PT DSC payload. CE 15x15 fuel assemblies with plugging clusters have also been evaluated.

For calculating the maximum internal pressure in the NUHOMS®-32PT DSC, it is assumed that 1% of the fuel rods are damaged for normal conditions, up to 10% of the fuel rods are damaged for off normal conditions, and 100% of the fuel rods will be damaged following a design basis accident event. A minimum of 100% of the fill gas and 30% of the fission gases (e.g., H-3, Kr and Xe) within the ruptured fuel rods are assumed to be available for release into the DSC cavity, consistent with NUREG-1536 [2.1].

The maximum design basis internal pressures for the NUHOMS®-32PT DSC are 15, 20 and 105 psig for normal, off-normal and accident conditions of storage, respectively.

M.2.1.1 General Operating Functions

No change.

Table M.2-1
Intact PWR Fuel Assembly Characteristics

<u>PHYSICAL PARAMETERS:</u>	
Fuel Class	<i>Only intact (including reconstituted) B&W 15x15, WE 17x17, CE 15x15, WE 15x15, CE 14x14 and WE 14x14 class PWR assemblies or equivalent reload fuel manufactured by other vendors that are enveloped by the fuel assembly design characteristics listed in Table M.2-2.</i>
<i>Reconstituted Fuel Assemblies</i>	<i>≤ 32 assemblies per DSC with up to 56 stainless steel rods per assembly or unlimited number of lower enrichment UO₂ rods per assembly.</i>
Fuel Cladding Material	Zircaloy
Fuel Damage	Cladding damage in excess of pinhole leaks or hairline cracks is not authorized to be stored as "Intact PWR Fuel."
Burnable Poison Rod Assemblies (BPRAs)	Standard BPRA designs for the B&W 15x15 and Westinghouse 17x17 class assemblies as listed in Appendix J of the FSAR.
Maximum Assembly plus BPRA Weight	-1365 lbs for 32PT-S100 & 32PT-L100 DSC System -1682 lbs for 32PT-S125 & 32PT-L125 DSC System
BPRA Damage	BPRAs with cladding failures are acceptable for loading.
<u>THERMAL/RADIOLOGICAL PARAMETERS:</u>	
Fuel Burnup and Cooling Time without BPRAs	Per Table M.2-5, Table M.2-6, Table M.2-7, Table M.2-8, Table M.2-9; and Figure M.2-1 or Figure M.2-2 or Figure M.2-3.
Fuel Burnup and Cooling Time with BPRAs	Per Table M.2-10, Table M.2-11, Table M.2-12, Table M.2-13, Table M.2-14; and Figure M.2-1 or Figure M.2-2 or Figure M.2-3.
Initial Enrichment	Per Table M.2-3; and Figure M.2-4 or Figure M.2-5 or Figure M.2-6, as applicable.
B&W 15x15 BPRA Burnup and Cooling Time	BPRA Burnup shall not exceed that of a BPRA irradiated in fuel assemblies with a total Burnup of 36,000 MWd/MTU. -Minimum Cooling Time 5 years
WE 17x17 BPRA Burnup and Cooling Time	BPRA Burnup shall not exceed that of a BPRA irradiated in fuel assemblies with a total Burnup of 36,000 MWd/MTU. -Minimum Cooling Time 10 years

Table M.2-2
PWR Fuel Assembly Design Characteristics

Assembly Class	B&W 15x15	WE 17x17	CE 15x15 ⁽¹⁾	WE 15x15	CE 14x14	WE 14x14
DSC Configuration	Max Unirradiated Length (in)					
32PT-S100/32PT-L100	165.75	165.75	165.75	165.75	165.75	165.75
32PT-S125/32PT-L125	171.71 ⁽¹⁾	171.71 ⁽¹⁾	171.71	171.71	171.71	171.71
Fissile Material	UO ₂	UO ₂	UO ₂	UO ₂	UO ₂	UO ₂
Maximum MTU/Assembly ⁽²⁾	0.475	0.475	0.475	0.475	0.475	0.475
Maximum Number of Fuel Rods	208	264	216	204	176	179
Maximum Number of Guide/ Instrument Tubes	17	25	9	21	5	17

⁽¹⁾ Maximum Assembly + BPRA Length (unirradiated)

⁽²⁾ The maximum MTU/assembly is based on the shielding analysis. The listed value is higher than the actual.

⁽¹⁾ CE 15x15 assemblies with stainless steel plugging clusters installed are acceptable.

Table M.2-3
Initial Enrichment, Required Number of PRAs and Minimum Soluble Boron Loading
(NUHOMS®-32PT DSC)

Assembly Class and Type	Minimum Soluble Boron Loading (ppm)	Initial Enrichment, wt % U-235			
		0 PRA (Type A Basket)	4 PRAs (Type B Basket)	8 PRAs (Type C Basket)	16 PRAs (Type D Basket)
WE 17x17 Fuel Assembly ⁽¹⁾ Westinghouse 17x17 LOPAR/Standard Westinghouse 17x17 OFA/Vantage 5,+ ⁽²⁾	2500	3.40	4.00	4.50	5.00
B&W 15x15 Mark B Fuel Assembly ⁽¹⁾	2500	3.30	3.90	NE	5.00
WE 15x15 Fuel Assembly Westinghouse 15x15 Standard/ZC Exxon/ANF 15x15 WE	2500	3.40	4.00	4.60	5.00
CE 14x14 Fuel Assembly CE 14x14 Standard/Generic CE 14x14 Fort Calhoun	1800	3.35	3.90	4.35	NE
	2000	3.50	4.10	4.55	NE
	2100	3.60	4.20	4.70	NE
	2200	3.70	4.30	4.80	NE
	2300	3.75	4.40	4.90	NE
	2400	3.80	4.50	5.00	NE
	2500	3.90	4.55	-	NE
WE 14x14 Fuel Assembly Westinghouse 14x14 ZCA/ZCB Westinghouse 14x14 OFA Exxon/ANF 14x14 WE	1800	3.55	4.25	NE	NE
	2000	3.75	4.50	NE	NE
	2100	3.80	4.60	NE	NE
	2200	3.90	4.70	NE	NE
	2300	4.00	4.85	NE	NE
	2400	4.10	4.95	NE	NE
	2500	4.15	5.00	NE	NE
CE 15x15 Fuel Assembly CE 15x15 Palisades Exxon/ANF 15x15 CE	1800	3.00	NE	NE	NE
	2000	3.15	NE	NE	NE
	2100	3.20	NE	NE	NE
	2200	3.30	NE	NE	NE
	2300	3.35	NE	NE	NE
	2400	3.40	NE	NE	NE
	2500	3.50	NE	NE	NE

NOTES:

(1) With or without BPRAs. BPRAs shall not be stored in basket location where a PRA is required.

(2) Includes all Vantage versions (5, +, ++, etc.).

NE - Not Evaluated

Table M.2-5
PWR Fuel Qualification Table for 1.2 kW per Assembly for the NUHOMS®-32PT DSC (Fuel w/o BPRAs)
 (Minimum required years of cooling time after reactor core discharge)

Burn-Up GWd/ MTU	Assembly Average Initial U-235 Enrichment, wt %																																					
	1.1	1.2	1.4	1.6	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	
10	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
15	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
20	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
25	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
28	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
30	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
32	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
34	7.0	7.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
36	8.0	8.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
38	9.0	9.0	8.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
39	10.0	9.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
40	10.0	10.0	9.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
41	11.0	10.0	10.0	9.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
42	11.5	11.0	10.0	9.0	9.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
43	13.0	11.5	10.5	10.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
44	13.5	12.5	11.5	10.5	10.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
45	14.5	14.0	12.0	11.0	10.0	10.0	10.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- *For fuel assemblies reconstituted with up to 10 stainless steel rods, increase the indicated cooling time by 1.5 years. If more than 10 stainless steel rods are present, increase the indicated cooling time by 6 years.*
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 1.1 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a six-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

Table M.2-6
PWR Fuel Qualification Table for 0.87 kW per Assembly for the NUHOMS®-32PT DSC (Fuel w/o BPRAs)

(Minimum required years of cooling time after reactor core discharge)

Burn-Up GWd/ MTU	Assembly Average Initial U-235 Enrichment, wt %																																					
	1.1	1.2	1.4	1.6	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	
10	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
15	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
20	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
25	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
28	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
30	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
32	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
34	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	
36	9.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
38	9.0	9.0	8.5	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	
39	10.0	9.0	9.0	8.5	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
40	10.0	10.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
41	11.0	10.5	10.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
42	12.0	11.5	11.0	10.5	10.0	10.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
43	13.0	12.0	10.5	10.5	10.5	10.5	10.5	10.5	10.0	10.0	10.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
44	13.0	13.0	12.5	12.0	11.5	10.5	10.5	10.5	10.0	10.0	10.0	10.0	9.5	9.5	9.5	9.5	9.5	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.0	8.0	
45	14.0	13.5	13.0	12.5	12.5	12.0	12.0	12.0	10.5	10.5	10.5	10.5	10.5	10.5	10.0	10.0	10.0	9.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- For fuel assemblies reconstituted with up to 10 stainless steel rods, increase the indicated cooling time by 1.5 years. If more than 10 stainless steel rods are present, increase the indicated cooling time by 6 years.
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 1.1 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a eight-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

Table M.2-7
PWR Fuel Qualification Table for 0.7 kW per Assembly for the NUHOMS®-32PT DSC (Fuel w/o BPRAs)

(Minimum required years of cooling time after reactor core discharge)

Burn-Up GWd/ MTU	Assembly Average Initial U-235 Enrichment, wt %																																					
	1.1	1.2	1.4	1.6	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	
10	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
15	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
20	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
25	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
28	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
30	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
32	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	
34	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
36	10.5	10.0	10.0	10.0	10.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
38	13.0	13.0	11.5	11.5	11.0	11.0	11.0	10.5	10.5	10.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
39	14.0	14.0	13.5	13.0	12.0	11.5	11.5	11.5	11.5	11.5	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
40	14.5	14.5	14.0	14.0	13.5	13.5	13.0	13.0	12.0	12.0	12.0	12.0	11.5	11.5	11.5	11.5	11.5	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	10.0	10.0	10.0	10.0	10.0	10.0	
41	16.5	16.0	15.5	14.5	14.0	14.0	14.0	14.0	13.5	13.5	13.5	13.5	13.5	13.5	12.5	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
42	18.0	16.5	16.5	16.0	15.5	15.5	14.5	14.5	14.5	14.5	14.0	14.0	14.0	14.0	14.0	14.0	13.5	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	
43	18.5	18.0	18.0	16.5	16.5	16.5	16.0	16.0	16.0	16.0	16.0	15.5	15.5	14.5	14.5	14.5	14.5	14.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	
44	20.0	19.0	18.5	18.5	18.0	18.0	18.0	17.5	16.5	16.5	16.5	16.5	16.0	16.0	16.0	16.0	16.0	16.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	
45	21.0	21.0	20.0	19.0	19.0	19.0	18.5	18.5	18.0	18.0	18.0	18.0	18.0	18.0	17.5	16.5	16.5	16.5	16.5	16.0	16.0	16.0	16.0	16.0	16.0	16.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- *For fuel assemblies reconstituted with up to 10 stainless steel rods, increase the indicated cooling time by 1.5 years. If more than 10 stainless steel rods are present, increase the indicated cooling time by 6 years.*
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 1.1 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a thirteen-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

Table M.2-8
PWR Fuel Qualification Table for 0.63 kW per Assembly for the NUHOMS®-32PT DSC (Fuel w/o BPRAs)

(Minimum required years of cooling time after reactor core discharge)

Burn-Up GWd/ MTU	Assembly Average Initial U-235 Enrichment, wt %																																						
	1.1	1.2	1.4	1.6	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0		
10	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
15	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
20	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
25	6.5	6.5	6.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
28	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
30	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
32	9.5	9.5	9.5	9.5	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	
34	11.0	11.0	11.0	10.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	
36	13.5	13.5	13.0	12.0	12.0	11.5	11.5	11.5	11.5	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
38	16.5	15.5	14.5	14.5	14.5	13.5	13.5	13.5	13.5	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	11.0	11.0	11.0	11.0	
39	17.5	17.0	16.5	16.0	15.0	15.0	14.5	14.5	14.5	14.5	14.5	14.0	14.0	14.0	14.0	14.0	14.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0	
40	19.0	18.0	18.0	17.0	16.5	16.5	16.5	16.5	16.0	16.0	16.0	16.0	16.0	15.0	15.0	15.0	15.0	15.0	15.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.0	13.0	13.0	13.0	
41	20.5	19.5	19.0	19.0	18.0	18.0	17.5	17.5	17.5	17.0	17.0	17.0	17.0	17.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.0	
42	22.0	20.5	20.5	19.5	19.5	19.5	19.0	19.0	18.5	18.5	18.5	18.0	18.0	18.0	18.0	18.0	18.0	17.0	17.0	17.0	17.0	17.0	17.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	
43	23.0	22.5	22.5	21.5	21.5	21.0	20.0	20.0	19.5	19.5	19.5	19.0	19.0	19.0	19.0	19.0	19.0	19.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	
44	24.5	24.5	23.0	23.0	22.0	22.0	22.0	22.0	21.5	21.5	21.5	21.0	21.0	21.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	
45	25.5	25.5	25.0	24.0	23.0	23.0	23.0	23.0	23.0	22.5	22.5	22.5	22.0	22.0	22.0	22.0	22.0	21.0	21.0	21.0	21.0	21.0	21.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.0	19.0	

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- *For fuel assemblies reconstituted with up to 10 stainless steel rods, increase the indicated cooling time by 1.5 years. If more than 10 stainless steel rods are present, increase the indicated cooling time by 6 years.*
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 1.1 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a sixteen-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

Table M.2-9
PWR Fuel Qualification Table for 0.6 kW per Assembly for the NUHOMS®-32PT DSC (Fuel w/o BPRAs)

(Minimum required years of cooling time after reactor core discharge)

Burn-Up GWd/ MTU	Assembly Average Initial U-235 Enrichment, wt %																																					
	1.1	1.2	1.4	1.6	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	
10	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
15	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
20	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
25	6.5	6.5	6.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0
28	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
30	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
32	10.5	10.5	9.5	9.5	9.5	9.5	9.5	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
34	12.0	12.0	12.0	11.5	11.0	11.0	11.0	11.0	11.0	11.0	11.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	9.0	9.0	9.0	9.0	9.0	9.0
36	14.5	14.5	14.0	14.0	13.5	13.5	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
38	17.5	17.5	16.5	16.5	16.5	16.0	16.0	15.5	15.5	15.0	15.0	15.0	15.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
39	19.5	19.0	18.5	18.0	17.0	16.5	16.5	16.5	16.5	16.0	16.0	16.0	16.0	16.0	16.0	16.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
40	20.5	20.0	20.0	19.0	19.0	18.5	18.5	18.5	18.0	18.0	18.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	15.0	15.0	15.0	15.0	15.0	15.0
41	22.5	21.5	21.0	21.0	20.0	20.0	19.5	19.5	19.5	19.0	19.0	19.0	19.0	19.0	19.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
42	24.0	22.5	22.5	21.5	21.5	21.5	21.0	21.0	21.0	21.0	21.0	20.0	20.0	20.0	20.0	20.0	20.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
43	25.0	24.5	24.5	23.5	23.5	23.0	22.0	22.0	22.0	21.5	21.5	21.5	21.0	21.0	21.0	21.0	21.0	21.0	21.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.0	19.0	19.0	19.0
44	26.5	26.5	25.0	25.0	24.0	24.0	24.0	24.0	23.5	23.5	23.5	23.0	23.0	23.0	23.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	20.0	20.0
45	27.5	27.5	27.0	26.0	26.0	25.0	25.0	25.0	25.0	24.5	24.5	24.5	24.0	24.0	24.0	24.0	24.0	24.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0

- Use burnup and enrichment to lookup minimum cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.
- *For fuel assemblies reconstituted with up to 10 stainless steel rods, increase the indicated cooling time by 1.5 years. If more than 10 stainless steel rods are present, increase the indicated cooling time by 6 years.*
- Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.
- Fuel with an initial enrichment less than 1.1 and greater than 5.0 wt.% U-235 is unacceptable for storage.
- Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage
- Fuel with a burnup less than 10 GWd/MTU is acceptable for storage after 5-years cooling.
- Example: An assembly with an initial enrichment of 3.75 wt. % U-235 and a burnup of 41.5 GWd/MTU is acceptable for storage after a nineteen-year cooling time as defined by 3.7 wt. % U-235 (rounding down) and 42 GWd/MTU (rounding up) on the qualification table.

M.5 Shielding Evaluation

The radiation shielding evaluation for the Standardized NUHOMS® System (during loading, transfer and storage) for the 24P and 52B canisters is discussed in Sections 3.3.5, 7.0 and 8.0. The following radiation shielding evaluation specifically addresses the dose rates due to design-basis PWR fuel and Burnable Poison Rod Assemblies (BPRAs) loaded in a NUHOMS®-32PT DSC. The shielding analysis is carried out for the four DSC configurations of the NUHOMS®-32PT system described in Section M.2.1. The basket layout for these configurations is identical except for the length of the DSC components. For shielding purposes, the only difference between the 32PT-S100/32PT-L100 and 32PT-S125/32PT-L125 versions is the thickness of the shield plug designs. The 32PT-S100/32PT-L100 versions have somewhat thinner shield plugs than the 32PT-S125/32PT-L125 versions. Each of the configurations is designed to store up to 32 intact standard PWR fuel assemblies. The 32PT-L100 and 32PT-L125 are also designed to store up to 32 intact standard PWR fuel assemblies with or without BPRAs. Therefore, for shielding purposes, the two long-cavity versions bound the short-cavity versions because of the additional gamma source due to the BPRAs. Therefore, the shielding evaluation presented herein is performed only for the 32PT-L100 and 32PT-L125 with fuel plus BPRAs. To assure that this evaluation is conservative, the fuel source terms are not adjusted to account for the additional decay required to accommodate the BPRAs.

The design-basis PWR fuel source terms are derived from the bounding fuel, B&W 15x15 Mark B assembly design as described in Section M.5.2

The NUHOMS®-32PT DSCs can store intact (*including reconstituted*) PWR fuel assemblies and BPRAs with the characteristics described in Table M.2-1. The NUHOMS®-32PT DSC may store PWR fuel assemblies arranged in any of three alternate heat zoning configurations with a maximum decay heat of 1.2 kW per assembly and a maximum heat load of 24 kW per canister. The heat load configurations are shown in Figure M.2-1, Figure M.2-2 and Figure M.2-3. Note that while the B&W, CE, and Westinghouse fuel designs are specifically listed, storing reload fuel designed by other manufacturers is also allowed provided an analysis is performed to demonstrate that the limiting features listed in Table M.2-1 bound the specific manufacturers replacement fuel. The limiting features are burnup, initial enrichment, cooling time, fissile material type, number of fuel rods, number of guide tube/instrument tube holes, cobalt impurities in the hardware and initial heavy metal.

The design-basis fuel source terms for this evaluation are defined as the source terms from fuel with the burnup/initial enrichment/cooling time combination given in Table M.2-5 through Table M.2-9 (without BPRAs) and located in the basket as shown in Figure M.2-1, Figure M.2-2 or Figure M.2-3, that gives the maximum dose rate on the surface of the HSM and/or OS197/OS197H Transfer Cask (TC). This approach is consistent with the method used to generate the fuel qualification tables for the Standardized NUHOMS®-24P and -52B canister designs as described in Section 7.2.3.

The Heat Load Zoning Configuration 2 (Figure M.2-2) is the configuration that produces the highest dose rates on the surfaces of the HSM and TCs. These bounding gamma and neutron source terms are then used in the radiation shielding models to conservatively calculate dose

rates on and around the NUHOMS®-32PT system. In order to model Heat Load Zoning Configuration 2, all sixteen assemblies in the outer ring of the DSC are modeled with source terms consistent with 1.2 kW. Therefore, the source terms result in fairly conservative dose rates because the shielding analysis is based on a 28.8 kW heat load compared to the 24 kW heat load limit.

The bounding burnup, minimum initial enrichment and cooling time combinations used in this analysis are as follows:

- 30 GWd/MTU, 2.5 wt. % U-235, 8-year cooled – Inner sixteen assemblies in the HSM models,
- 41 GWd/MTU, 3.1 wt. % U-235, 5-year cooled – Outer sixteen assemblies in the HSM and TC models, and
- 45 GWd/MTU, 3.3 wt. % U-235, 23-year cooled - Inner sixteen assemblies in the TC models.

The design-basis source terms for the authorized BPRAs are taken from Appendix J. The design-basis source terms cover three BPRA designs: (1) B&W 15x15 Burnable Absorber Assemblies with up to 2 cycles burnup and 5-year cooled, (2) WE 17x17 Pyrex Burnable Absorber, 2-24 Rodlets with up to 2 cycles burnup and 10-year cooled, and (3) WE 17x17 WABA Burnable Absorber, 3-24 Rodlets with up to 2 cycles burnup and 10-year cooled. The properties used to calculate the design-basis source terms for the authorized BPRAs are reproduced in Table M.5-2.

Reconstituted fuel assemblies with up to 56 solid stainless steel rods or unlimited number of lower enrichment UO₂ rods that replace fuel rods are also acceptable for the 32PT DSC payload. Note that the lower enriched UO₂ rods are of similar design and behavior as the standard fuel rods aside from the uranium enrichment. The reconstituted rods may be placed at any location in the fuel assembly and the reconstituted assemblies may be placed anywhere in the basket. The cooling time required for reconstituted fuel assembly is increased consistent with the fuel qualification Table M.2-5 through Table M.2-9.

CE 15x15 fuel assemblies with plugging clusters having a nominal mass of 2.3 kg 304L stainless steel (including 0.1 kg Inconel x-750) are evaluated. The material weights in the top, plenum and the incore region (including the weight of the heavy metals) used for the design basis source term calculation bound the CE 15x15 fuel assembly with plugging clusters.

The methodology, assumptions, and criteria used in this evaluation are summarized in the following subsections.

M.5.2 Source Specification

Thermal and radiological source terms are calculated with the SAS2H/ORIGEN-S modules of SCALE 4.4 [5.1] for the fuel. The SAS2H/ORIGEN-S results are used to develop the fuel qualification tables listed in Table M.2-5 through Table M.2-14 and the design-basis fuel source terms suitable for use in the shielding calculations. The thermal and radiological source terms for the BPRAs are taken from Appendix J.

The B&W 15x15 assembly is the bounding fuel assembly design for shielding purposes because it has the highest initial heavy metal loading as compared to the 14x14, other 15x15, and 17x17 fuel assemblies which are also authorized contents of the NUHOMS®-32PT DSC. In addition, the maximum Co59 content of the hardware regions for each assembly type is less than that of the B&W 15x15 Mark B fuel assembly. The neutron flux during reactor operation is peaked in the in-core region of the fuel assembly and drops off rapidly outside the in-core region. Much of the fuel assembly hardware is outside of the in-core region of the fuel assembly. To account for this reduction in neutron flux, the fuel assembly is divided into four exposure "regions." The four axial regions used in the source term calculation are: the bottom (nozzle) region, the in-core region, the (gas) plenum region, and the top (nozzle) region. The B&W 15x15 fuel assembly masses for each irradiation region are listed in Table M.5-6. The light elements that make up the various materials for the various fuel assembly materials are taken from reference [5.4] and are listed in Table M.5-7. The design-basis heavy metal weight is 0.475 MTU. These masses are irradiated in the appropriate fuel assembly region in the SAS2H/ORIGEN-S models. To account for the reduction in neutron flux outside the In-Core regions neutron flux (fluence) correction factors are applied to light element composition for each region. The neutron flux correction factors are given in Table M.5-8.

The original fuel qualification tables (FQT's) are generated based on the decay heat limits for the various heat load zoning configurations shown in Figure M.2-1, Figure M.2-2 and Figure M.2-3. SAS2H is used to calculate the minimum required cooling time as a function of assembly initial enrichment and burnup for each decay heat limit. The total decay heat includes the contribution from the fuel as well as the hardware in the entire assembly. The fuel qualification table for fuel plus BPRAs also includes 8 watts per BPRA to account for the design-basis decay heat from the BPRAs. Because the decay heat generally increases slightly with decreasing enrichment for a given burnup, it is conservative to assume that the required cooling time for a higher enrichment assembly is the same as that for a lower enrichment assembly with the same burnup. The required cooling time for initial enrichments that fall between any two SAS2H runs are assumed to be that of the lower enrichment case results. The method in by which these expanded tables were developed differ slightly than the original method. However, the computer programs used and general approach remain unchanged. The expanded FQT decay times are generated by selecting cooling times such that the design basis source terms remain bounding and all decay heat limits are met.

The original FQT's were developed for U-235 enrichments in the range 2.0-5.0 wt.% and burnup in the range 10-45 GWd/MTU. The FQT's without BPRAs are expanded to also include fuel with a lower enrichment range of 1.1 to 1.9 wt.% U-235. The FQT's with BPRAs have not been modified.

Reconstituted fuel assemblies containing up to 56 stainless steel rods that replace fuel rods are also acceptable for the 32PT DSC payload provided the cooling time requirements of the fuel qualification tables are met. Additional discussion of the methodology used to evaluate reconstituted fuel assemblies is provided in Section M.5.2.5.

The design-basis source terms are defined as the burnup/initial enrichment/cooling time combination given in the fuel qualification tables that result in the maximum dose rate on the surface of the HSM and OS197/OS197H TC. *The cooling times for the expanded fuel qualification table entries are selected so that the design-basis source terms remain bounding.* The 1-D discrete ordinates code ANISN [5.5] and the CASK-81 22 neutron, 18 gamma-ray energy group, coupled cross-section library [5.3] is used to determine these design-basis source terms. Finding the burnup/initial enrichment/cooling time combinations from the fuel qualification tables and decay heat load zoning configurations that produce the maximum dose rate on the HSM roof determine the design-basis source term for the HSM shielding calculations. Similarly the design-basis source terms for the OS197/OS197H TC are determined by finding the maximum surface dose rates on the side of the cask. This approach, described in detail in Section M.5.2.4, is consistent with the method used to determine the fuel qualification tables for the Standardized NUHOMS® canister designs described in Section 7.2.3.

The radiological source terms generated in the SAS2H/ORIGEN-2 runs are used in the ANISN evaluations to calculate the surface dose rates. The ANISN models are similar to the appropriate DORT models for the locations of interest. Heat load configuration 2 (Figure M.2-2) produced the bounding total surface dose rate for both the HSM and TC. The HSM design-basis source terms for the outer ring of assemblies (modeled as sixteen assemblies) are from fuel with 41 GWd/MTU burnup, an initial enrichment of 3.1 wt. % U-235 and 5-years cooling. The HSM design-basis source terms for the inner sixteen assemblies are from fuel with 30 GWd/MTU burnup, and initial enrichment of 2.5 wt. % U-235 and 8-years cooling. Note that using this approach in modeling the outer ring of sixteen assemblies with the 1.2 kW source terms for all of the shielding analyses results in fairly conservative dose rates because the shielding analysis is in reality based on a 28.8 kW heat load. The TC design-basis source terms for the outer ring of assemblies (conservatively modeled as sixteen assemblies) are from fuel with 41 GWd/MTU burnup, an initial enrichment of 3.1 wt. % U-235 and 5-years cooling. The TC design-basis source terms for the inner sixteen assemblies are from fuel with 45 GWd/MTU burnup, and initial enrichment of 3.3 wt. % U-235 and 23-years cooling.

A sample SAS2H/ORIGEN-S input file for the In-Core Region for the 41 GWd/MTU, 3.1 wt. % U-235 and 5-years cooling case is listed and commented in Section M.5.5.1.

M.5.2.1 Gamma Source

Four SAS2H/ORIGEN-S runs are required for each burnup/initial enrichment/cooling time combination to determine gamma source terms for the four regions of interest for each fuel assembly; the bottom, in-core, plenum and top regions. The only difference between the runs is in Block #10 "Light Elements" of the SAS2H input and the 81\$\$ card in the ORIGEN-S input. Each run includes the appropriate Light Elements for the region being evaluated and the 81\$\$ card is adjusted to have ORIGEN-S output the total gamma source for the in-core region and only the light element source for the plenum and top nozzle regions.

The design-basis source terms for the authorized BPRA designs are taken from Appendix J of the FSAR. The design-basis source terms from Appendix J of the FSAR cover three BPRA designs 1) B&W 15x15 Burnable Absorber Assemblies with up to 2 cycles burnup and 5-year cooled, 2) WE 17x17 Pyrex Burnable Absorber, 2-24 Rodlets with up to 2 cycles burnup and 10-year cooled, and 3) WE 17x17 WABA Burnable Absorber, 3-24 Rodlets with up to 2 cycles burnup and 10-year cooled.

The SAS2H/ORIGEN-S gamma ray source is output in the CASK-81 energy group structure.

Gamma source terms for the in-core region include contributions from actinides, fission products, and activation product. The bottom, plenum and top nozzle regions include the contribution from the activation products in the specified region only. These results for the 41 GWd/MTU, 3.1 wt. % U-235 and 5-years cooling case are shown in Table M.5-9. The results for the 30 GWd/MTU, 2.5 wt. % U-235 and 8-years cooling case are shown in Table M.5-10. Finally, the results for the 45 GWd/MTU, 3.3 wt. % U-235 and 23-years cooling case are shown in Table M.5-11.

As stated above the design-basis BPRA source terms are taken from Appendix J of the FSAR and are listed in Table M.5-12.

Gamma source terms for use in the shielding models are calculated by multiplying the assembly sources by the number of assemblies in the region of interest (16) and dividing by the appropriate inner/outer heat load region volume. The appropriate assembly region volumes for both the inner and outer heat load zones are listed in Table M.5-13.

M.5.2.2 Neutron Source Term

One SAS2H/ORIGEN-S run is required for each burnup/initial enrichment/cooling time combination to determine the total neutron source terms for the in-core regions. The results for each burnup/initial enrichment/cooling time combination of interest are summarized in Table M.5-14.

Neutron source terms for use in the shielding models are calculated by multiplying the assembly sources by the number of assemblies in the in-core region of interest (16) and dividing by the appropriate in-core inner/outer heat load region volume. The appropriate assembly region volumes for both the inner and outer heat load regions are listed in Table M.5-13.

M.5.2.3 Axial Peaking

Axial peaking factors for both neutron and gamma sources in PWR fuel are taken from Reference [5.6]. These peaking factors were derived from work performed by the Department of Energy in support of its Topical Report for burnup credit [5.7]. The neutron and gamma peaking factors are shown as a function of the core height in Table M.5-15. These factors are directly applied to each DORT interval in the fuel region. Neutron peaking factors in each zone are equal to the gamma factor raised to the fourth power to correctly account for the variation of neutron source with burnup. The axial source distribution defined in Table M.5-15 introduces some level of conservatism into this calculation because the length average peaking factor of 1.06 is greater than 1.

M.5.2.4 ANISN Evaluation for Bounding Source Terms

As discussed above, the *original* fuel qualification tables are generated based on the decay heat limits for the various heat load zoning configurations shown in Figure M.2-1, Figure M.2-2 and Figure M.2-3. *The expanded fuel qualification table decay times are generated by selecting cooling times such that the design-basis source terms remain bounding and all decay heat limits are met.* SAS2H is used to calculate the minimum required cooling time as a function of assembly initial enrichment and burnup for each decay heat limit. To determine which configuration and burnup, wt. % initial enrichment and cooling time combinations result in the bounding dose rates on the surface of the HSM and TC, the total source term, which includes the contribution from the fuel as well as the hardware in the entire assembly (including end fittings) is used to calculate its total ANISN dose rate on the HSM roof and TC radial using the ANISN code.

The BPRA contribution is fixed and is included in the design basis shielding evaluation as such and therefore is not included in this ANISN evaluation.

ANISN [5.5] determines the fluence of particles throughout one-dimensional geometric systems by solving the Boltzmann transport equation using the method of discrete ordinates. Particles can be generated by either particle interaction with the transport medium or extraneous sources incident upon the system. Anisotropic cross-sections can be expressed in a Legendre expansion of arbitrary order.

The ANISN code implements the discrete ordinates method as its primary mode of operation. Balance equations are solved for the flow of particles moving in a set of discrete directions in each cell of a space mesh and in each group of a multigroup energy structure. Iterations are performed until all implicitness in the coupling of cells, directions, groups, and source regeneration is resolved.

ANISN coupled with the CASK-81 22 neutron, 18 gamma-ray energy group, coupled cross-section library [5.3] and the ANSI/ANS-6.1.1-1977 flux-to-dose conversion factors [5.10] is chosen to generate the ANISN dose rates used to determine the relative strength of the various source terms from fuel assemblies to determine the design basis source terms for the HSM and TC. These design basis source terms are used with DORT to calculate the bounding system dose rates. ANISN provides an efficient method to calculate the design basis source terms.

The surface dose rates *for the original fuel qualification tables* are calculated using *individual* ANISN models to perform the evaluation for the fuel assembly parameters in the fuel qualification table. The ANISN model used to calculate the relative dose rates on the HSM surface is similar to the cut through the center of the DORT HSM roof model used for the shielding evaluation (for each configuration). The ANISN model used to generate the relative dose rates on the TC is similar to the cut through the center of the DORT TC side model used for the shielding evaluation. Figure M.5-31 and Figure M.5-32 provide sketches for the ANISN models of the HSM roof and TC centerline, respectively. When modeling 0.63 kW or 0.60 kW source region in Region A (16 assemblies) of Figure M.5-31 and Figure M.5-32, the Region B does not include any source terms. Similarly, when modeling 0.87 kW or 1.2 kW source region in Region B (16 assemblies), of these figures, the Region A does not include any source terms.

For modeling 0.7 kW source region, both Region A and Region B (32 total assemblies) include source terms corresponding to 0.7 kW. An example ANISN input file is included in Section M.5.5.5.

The material densities used in the ANISN models for the various model regions are listed in Table M.5-27. These material densities are very similar to those used for the DORT and MCNP analysis, but are simplified to reduce the size of the ANISN input decks. Only the important elements of a give material are included and the gram density of the material is maintained. The density of NS-3 is used instead of water in ANISN models. This has no impact on the results of ANISN evaluation because ANISN is only used to compare the relative strength of the source terms for each entry in the fuel qualification table.

The results of the ANISN runs *used to determine the design basis source* are given in Table M.5-28 through Table M.5-37. *Similar results for the expanded fuel qualification table entries are not provided because the expanded entries are bounded by the design-basis source.*

To determine the design basis source terms to be used in the HSM shielding calculations, the total roof surface dose rates for the configurations shown in Figure M.2-1, Figure M.2-2 and Figure M.2-3 are calculated using the results provided in Table M.5-28 through Table M.5-37. *Configuration 1 consists of sixteen 0.63 kW/FA inner assemblies and sixteen 0.87 kW/FA outer assemblies, Configuration 2 is based on bounding assumption of sixteen 0.6 kW/FA inner assemblies and sixteen 1.2 kW/FA outer assemblies, and Configuration 3 consists of thirty-two 0.7 kW/FA assemblies.*

For Configuration 1, the maximum total roof dose rate is 35.0 plus 0.19 or 35.2 mrem/hr. For Configuration 2, the total roof dose rate is 46.87 plus 0.16 or 47.03 mrem/hr, while for Configuration 3, the total roof dose rate is 28.4 mrem/hr. Based on these results, Configuration 2 results in the maximum dose rates for the HSM. Design basis source terms for the outer ring of assemblies (conservatively modeled as sixteen assemblies) are from fuel with 41 GWd/MTU burnup, an initial enrichment of 3.1 wt. % U-235 and 5 years cooling. The design basis source terms for the inner sixteen assemblies are from fuel with 30 GWd/MTU burnup, and initial enrichment of 2.5 wt. % U-235 and 8 year cooling. Note that using this approach in modeling, the outer ring of sixteen assemblies with the 1.2 kW source terms, results in fairly conservative dose rates because the shielding analysis is in reality based on a 28.8 kW heat load.

Similarly, to determine the design basis source terms to be used in the Transfer Cask shielding calculations, the total side centerline surface dose rates for the configurations shown in Figure M.2-1, Figure M.2-2 and Figure M.2-3 are calculated using the results provided in Table M.5-28 through Table M.5-37. For Configuration 1, the total side dose rate is 404.86 plus 34.57 or 439.43 mrem/hr. For Configuration 2, the total side dose rate is 593.8 plus 32.08 or 625.88 mrem/hr, while for Configuration 3, the total roof dose rate is 331.4 mrem/hr. Based on these results, Configuration 2 results in the maximum dose rates for the TC. Design basis source terms for the outer ring of assemblies (conservatively modeled as sixteen assemblies) are from fuel with 41 GWd/MTU burnup, an initial enrichment of 3.1 wt. % U-235 and 5 years cooling. The design basis source terms for the inner sixteen assemblies are from fuel with 45 GWd/MTU burnup, and initial enrichment of 3.3 wt. % U-235 and 23 year cooling.

For the expanded fuel qualification table entries, individual ANISN runs are not developed for each burnup, decay heat, and enrichment combination. Rather, ANISN is used to develop a "response function" to calculate the gamma and neutron dose rates. The ANISN response functions receive as input the neutron and gamma source terms as calculated by SAS2H. The response function methodology is numerically equivalent to modeling each individual case in ANISN (as was done for the original fuel qualification table entries) and is used simply to streamline the analysis.

Separate response functions are generated for the source in the inner 16 assemblies (for 0.63 and 0.6 kW/assembly heat loads), outer 16 assemblies (for 1.2 and 0.87 kW/assembly heat loads), and all 32 assemblies (for 0.7 kW/assembly heat load). These response functions are provided in Table M.5-38 through Table M.5-43.

To generate a gamma response function, a separate ANISN model is executed with a single gamma per assembly in each of the 18 CASK-81 gamma groups. Once the dose rate resulting from a single gamma per assembly is known for each energy group, the dose rate for a given gamma source can be determined simply by multiplying the source strength in each group by the dose rate contribution for that group and summing the results.

A neutron response function is generated in a similar fashion as a gamma response function, although only one ANISN neutron file is required because the neutron spectrum is adequately represented by the Cm-244 spectrum. Therefore, the ANISN model is executed with one neutron per assembly distributed throughout all 22 groups. The dose rate of secondary neutron capture gammas is calculated by ANISN in addition to the neutron dose rate. This method allows for the calculation of the neutron and capture gamma dose rate on the surface of the TC or HSM knowing only the magnitude of the neutron source.

Once the response functions have been generated, the following methodology is used to generate the expanded fuel qualification table entries indicated in Tables M.2-5 through M.2-9.

- 1) For each expanded fuel qualification entry, SAS2H computes the decay heat and source term for a range of cooling times. The cooling time is selected so that the decay heat is less than the respective decay heat limit. For the inner fuel assemblies (i.e., 0.6 and 0.63 kW/assembly), this cooling time is the final result. For the remaining fuel assembly types (i.e., 0.7, 0.87, and 1.2 kW/assembly), further analysis is required.*
- 2) The expanded fuel qualification table entries must result in dose rates bounded by the design-basis source. The dose rate of the design-basis source for the HSM and TC are 47.03 mrem/hr and 625.88 mrem/hr, respectively. These limits apply directly to Configuration 3, for which all 32 assemblies are the same. However, for Configurations 1 and 2, the total dose rate is computed by adding the contributions from the inner and outer assemblies. Therefore, the dose rate "limits" imposed on the inner and outer assemblies are somewhat arbitrary, as the combined dose rate must be less than the dose rate of the design basis source.*
- 3) Using the ANISN response functions, the maximum HSM and TC dose rates are computed for the expanded entries in the 0.6 and 0.63 kW/assembly fuel qualification*

tables. Therefore, the dose rate "limits" for the outer assemblies are computed by taking the difference of the total dose rate limit and the inner assembly dose rate "limit." The dose rate limits for all three configurations are summarized in Table M.5-44.

- 4) Using the ANISN response functions for the HSM and TC and the cooling times from Step 1, the dose rates are calculated for the expanded fuel qualification table entries for the 0.7, 0.87, and 1.2 kW/assembly tables. The dose rates for each cooling time must be below the dose rate limits as provided in Table M.5-44. When the dose rate exceeds either the HSM or TC limit, the cooling time is increased in 0.5 year increments until the dose rates are below the limits.

Therefore, all entries in the expanded fuel qualification tables result in decay heat less than the respective thermal limit and dose rates less than the dose rates of the design-basis source.

M.5.2.5 Reconstituted Fuel

As explained in Section M.5.2, reconstituted fuel assemblies may contain up to 56 stainless steel rods that replace fuel rods. Because steel rods replace fuel rods, the decay heat of a reconstituted assembly is typically less than the decay heat of an equivalent standard assembly. Conversely, because steel contains Co-59 which activates to form Co-60, for low cooling times a reconstituted assembly typically generates higher dose rates than an equivalent standard assembly.

To quantify this statement, additional SAS2H runs are generated for reconstituted assemblies. The SAS2H input files for a reconstituted assembly with 56 stainless steel rods are very similar to the input files for a standard assembly except for the following changes: (1) The number of fuel rods is reduced from 208 to 152 to account for 56 stainless steel rods, (2) the POWER input variable is adjusted to maintain the correct burnup for the reduced fuel loading, and (3) the light elements change to reflect that 56 fuel rods have been replaced with steel rods.

Note that a reconstituted rod cannot be irradiated for more than two cycles because the first cycle will always contain fresh, undamaged fuel. To accurately model this behavior, two SAS2H models are generated for each transition point. The first SAS2H model is for only one cycle of irradiation of 56 reconstituted rods, while the second SAS2H model is for three cycles of irradiation of 56 reconstituted rods. By subtracting the single cycle source term of the reconstituted rods from the total source term (fuel and reconstituted rods) for three cycles, the source term for three cycle irradiation of fuel and two cycle irradiation of reconstituted rods is generated.

This source term is inserted into the HSM and OS197/OS197H TC response functions to determine the dose rates for comparison to the design basis source dose rates. If the reconstituted fuel dose rate for either the HSM or OS197/OS197H TC exceeded the dose rate with design basis fuel, cooling time is increased for the reconstituted fuel source term calculation. When the reconstituted fuel with 56 stainless steel rods is analyzed using this approach, no more than 6 additional years of cooling time is required for reconstituted fuel to be bounded by the design basis source.

Similarly, for reconstituted fuel assemblies with a maximum of 10 stainless steel rods, a maximum of 1.5 years of additional cooling time is required for reconstituted fuel to be bounded by the design basis source.

Table M.5-27A
Original and Expanded Fuel Qualification Table Range of Applicability

Burnup GWd/MTU	Maximum Assembly Average Initial U-235 Enrichment, wt %																																																
	1.1	1.2	1.4	1.6	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0												
10	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O										
15	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
20	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
25	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
28	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
30	E	E	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
32	E	E	E	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
34	E	E	E	E	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
36	E	E	E	E	E	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
38	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
39	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
40	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
41	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
42	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
43	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
44	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											
45	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O											

- Squares marked with an "O" represent the original fuel qualification table.
- Squares marked with an "E" represent the expanded fuel qualification table entries.
- Actual fuel qualification tables are provided in Chapter M.2, Tables M.2-5 through M.2-9.

Table M.5-28
1.2 kW Fuel in the HSM (*original FQT only*)

Burnup (GWd/MTU)	Initial Enrichment (wt. % U-235)	Cooling Time (years)	HSM Centerline Roof		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
20	2	5	0.02	21.77	21.79
25	2.1	5	0.06	28.12	28.18
28	2.3	5	0.08	31.44	31.52
30	2.5	5	0.09	33.38	33.47
32	2.6	5	0.11	35.78	35.89
34	2.7	5	0.14	38.21	38.35
36	2.8	5	0.16	40.66	40.83
38	3.0	5	0.18	42.66	42.84
39	3.0	5	0.20	44.14	44.34
41	3.1	5	0.24	46.64	46.87
42	3.1	6	0.25	36.59	36.84
	3.8	5	0.18	44.99	45.17
43	3.2	6	0.26	37.33	37.59
	4.5	5	0.14	43.79	43.93
45	3.3	6	0.30	39.24	39.54

Bold indicates maximum calculated surface dose rate and/or source term used for design basis fuel

Table M.5-29
1.2 kW Fuel in the Transfer Cask (original FQT only)

Burnup (GWd/MTU)	Initial Enrichment (wt. % U-235)	Cooling Time (years)	Cask Centerline Side		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
20	2	5	11.66	223.68	235.33
25	2.1	5	27.81	289.62	317.43
28	2.3	5	38.35	323.53	361.88
30	2.5	5	44.37	342.99	387.36
32	2.6	5	54.36	367.86	422.21
34	2.7	5	65.56	393.23	458.79
36	2.8	5	78.04	419.09	497.13
38	3.0	5	86.66	439.24	525.89
39	3.0	5	96.41	455.35	551.76
41	3.1	5	111.88	481.92	593.80
42	3.1	6	118.75	386.55	505.31
	3.8	5	85.60	458.58	544.17
43	3.2	6	123.86	394.30	518.16
	4.5	5	67.54	441.47	509.01
45	3.3	6	141.27	415.56	556.83

Bold indicates Maximum Calculated Surface Dose Rate and/or source term used for Design Basis Fuel

Table M.5-30
0.87 kW Fuel in the HSM (original FQT only)

Burnup (GWd/MTU)	Initial Enrichment (wt. % U-235)	Cooling Time (years)	HSM Centerline Roof		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
20	2	5	0.02	21.77	21.79
25	2.1	5	0.06	28.12	28.18
28	2.3	5	0.08	31.44	31.52
30	2.5	5	0.09	33.38	33.47
32	2.6	6	0.11	27.30	27.41
	2.8	5	0.10	34.90	35.00
34	2.7	6	0.13	29.13	29.26
	4.9	5	0.04	31.02	31.06
36	2.8	6	0.16	30.95	31.11
38	3.0	7	0.17	26.07	26.24
	4.6	6	0.08	27.69	27.77
39	3.0	7	0.19	26.96	27.15
40	3.4	7	0.17	26.63	26.80
41	4.3	7	0.12	25.17	25.29
42	3.1	8	0.23	24.43	24.67
43	3.2	9	0.23	21.23	21.46
	3.9	8	0.17	23.16	23.33
44	3.3	9	0.24	21.63	21.87
	4.9	8	0.12	21.89	22.01
45	3.3	10	0.26	19.29	19.54
	3.9	9	0.20	20.96	21.16

Bold indicates Maximum Calculated Surface Dose Rate

Table M.5-31
0.87 kW Fuel in the Transfer Cask (original FQT only)

Burnup (GWd/MTU)	Initial Enrichment (wt. % U-235)	Cooling Time (years)	Cask Centerline Side		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
20	2	5	11.66	223.68	235.33
25	2.1	5	27.81	289.62	317.43
28	2.3	5	38.35	323.53	361.88
30	2.5	5	44.37	342.99	387.36
32	2.6	6	52.33	285.54	337.87
	2.8	5	47.64	357.22	404.86
34	2.7	6	63.13	305.13	368.27
	4.9	5	19.47	307.49	326.95
36	2.8	6	75.14	324.85	399.98
38	3.0	7	80.37	276.46	356.83
	4.6	6	35.87	280.63	316.50
39	3.0	7	89.42	286.81	376.22
40	3.4	7	79.60	280.67	360.27
41	4.3	7	55.93	260.02	315.95
42	3.1	8	110.12	263.50	373.62
43	3.2	9	110.60	229.81	340.41
	3.9	8	80.43	244.00	324.44
44	3.3	9	115.24	234.21	349.46
	4.9	8	55.82	225.34	281.15
45	3.3	10	121.49	210.06	331.55
	3.9	9	93.82	222.77	316.59

Bold indicates maximum calculated surface dose rate

Table M.5-32
0.7 kW Fuel in the HSM (original FQT only)

Burnup (GWd/MTU)	Initial Enrichment (wt. % U-235)	Cooling Time (years)	HSM Centerline Roof		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
20	2	5	0.03	21.92	21.95
25	2.1	5	0.07	28.33	28.40
28	2.3	6	0.10	24.25	24.35
	4.0	5	0.03	26.05	26.09
30	2.5	6	0.11	25.69	25.81
32	2.6	7	0.13	22.19	22.32
	4.7	6	0.04	21.98	22.02
34	2.7	8	0.16	19.76	19.92
	3.6	7	0.09	21.19	21.28
36	2.8	9	0.18	17.92	18.10
	3.4	8	0.13	19.49	19.62
38	3.0	10	0.19	16.25	16.44
	3.7	9	0.13	17.29	17.42
39	3.0	11	0.21	14.74	14.95
	3.2	10	0.19	16.41	16.60
40	3.1	11	0.22	15.05	15.26
	4.5	10	0.11	14.90	15.01
41	3.1	12	0.23	13.74	13.97
	4.1	11	0.14	14.01	14.15
42	3.1	13	0.24	12.62	12.86
	3.9	12	0.17	13.05	13.22
43	3.2	14	0.18	12.00	12.17
	3.9	13	0.24	11.52	11.76
44	3.3	15	0.25	10.57	10.81
	4.0	14	0.18	10.99	11.17
45	3.3	16	0.26	9.83	10.09
	4.0	15	0.19	10.20	10.39

Bold indicates maximum calculated surface dose rate

Table M.5-33
0.7 kW Fuel in the Transfer Cask (original FQT only)

Burnup (GWd/MTU)	Initial Enrichment (wt. % U-235)	Cooling Time (years)	Cask Centerline Side		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
20	2	5	15.63	226.35	241.98
25	2.1	5	37.29	294.11	331.40
28	2.3	6	49.58	256.64	306.21
	4.0	5	16.98	261.14	278.12
30	2.5	6	57.33	271.68	329.01
32	2.6	7	67.64	238.18	305.82
	4.7	6	20.98	222.08	243.06
34	2.7	8	78.60	214.50	293.10
	3.6	7	47.49	221.70	269.19
36	2.8	9	90.11	196.42	286.54
	3.4	8	65.75	207.62	273.36
38	3.0	10	96.37	178.68	275.05
	3.7	9	67.84	184.07	251.91
39	3.0	11	103.27	163.21	266.48
	3.2	10	95.82	179.66	275.48
40	3.1	11	108.34	166.85	275.19
	4.5	10	54.79	155.16	209.95
41	3.1	12	115.40	153.42	268.82
	4.1	11	71.35	148.38	219.73
42	3.1	13	122.52	142.01	264.52
	3.9	12	84.12	139.90	224.03
43	3.2	14	123.08	129.68	252.76
	3.9	13	89.60	129.05	218.66
44	3.3	15	123.54	118.94	242.48
	4.0	14	90.65	117.86	208.51
45	3.3	16	130.26	111.63	241.89
	4.0	15	96.03	109.78	205.81

Bold indicates maximum calculated surface dose rate

Table M.5-34
0.63 kW Fuel in the HSM (original FQT only)

Burnup (GWd/MTU)	Initial Enrichment (wt. % U-235)	Cooling Time (years)	HSM Centerline Roof		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
20	2	5	0.01	0.15	0.16
25	2.1	6	0.01	0.15	0.17
	3	5	0.01	0.18	0.19
28	2.3	7	0.02	0.14	0.16
	2.6	6	0.02	0.16	0.18
30	2.5	7	0.02	0.15	0.18
32	2.6	8	0.03	0.14	0.17
	5.0	7	0.01	0.10	0.11
34	2.7	9	0.03	0.14	0.17
36	2.8	11	0.03	0.13	0.17
	3.3	10	0.03	0.11	0.14
38	3.0	13	0.04	0.12	0.16
	3.1	12	0.04	0.13	0.16
	4.7	11	0.02	0.08	0.10
39	3.0	14	0.04	0.12	0.16
	3.1	13	0.04	0.13	0.16
	4.7	12	0.02	0.08	0.10
40	3.1	15	0.04	0.12	0.16
	3.3	14	0.04	0.12	0.15
	4.7	13	0.02	0.08	0.10
41	3.1	16	0.04	0.12	0.16
	3.5	15	0.03	0.11	0.14
	5.0	14	0.02	0.06	0.08
42	3.1	17	0.04	0.12	0.17
	3.7	16	0.03	0.10	0.14
43	3.2	18	0.04	0.12	0.16
	4.1	17	0.03	0.09	0.12
44	3.3	20	0.04	0.11	0.16
	3.4	19	0.04	0.11	0.16
	4.4	18	0.03	0.08	0.11
45	3.3	21	0.04	0.12	0.16
	3.7	20	0.04	0.10	0.14
	4.9	19	0.02	0.07	0.09

Bold indicates maximum calculated surface dose rate

Table M.5-35
0.63 kW Fuel in the Transfer Cask (*original FQT only*)

Burnup (GWd/MTU)	Initial Enrichment (wt. % U-235)	Cooling Time (years)	Cask Centerline Side		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
20	2	5	3.98	2.67	6.64
25	2.1	6	9.14	3.76	12.90
	3	5	4.81	3.11	7.92
28	2.3	7	12.15	4.26	16.41
	2.6	6	10.12	4.10	14.22
30	2.5	7	14.05	4.79	18.85
32	2.6	8	16.58	5.21	21.79
	5.0	7	16.58	5.21	21.79
34	2.7	9	19.27	5.73	25.00
36	2.8	11	21.28	6.00	27.28
	3.3	10	16.45	4.87	21.32
38	3.0	13	21.94	5.99	27.93
	3.1	12	21.50	5.96	27.46
	4.7	11	9.74	3.05	12.78
39	3.0	14	23.51	6.32	29.83
	3.1	13	23.06	6.28	29.33
	4.7	12	10.55	3.18	13.73
40	3.1	15	23.75	6.32	30.07
	3.3	14	22.10	5.97	28.06
	4.7	13	11.38	3.32	14.71
41	3.1	16	25.31	6.66	31.97
	3.5	15	21.22	5.69	26.91
	5.0	14	10.70	2.99	13.70
42	3.1	17	26.87	7.00	33.87
	3.7	16	20.42	5.44	25.85
43	3.2	18	27.00	6.99	33.99
	4.1	17	17.85	4.75	22.61
44	3.3	20	26.12	6.71	32.83
	3.4	19	25.76	6.65	32.41
	4.4	18	16.50	4.38	20.88
45	3.3	21	27.54	7.03	34.57
	3.7	20	23.46	6.05	29.51
	4.9	19	14.05	3.74	17.79

Bold indicates Maximum Calculated Surface Dose Rate

Table M.5-36
0.6 kW Fuel in the HSM (original FQT only)

Burnup (GWd/MTU)	Initial Enrichment (wt. % U-235)	Cooling Time (years)	HSM Centerline Roof		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
20	2	5	0.00	0.16	0.16
25	2.1	6	0.02	0.16	0.16
	4.7	5	0.00	0.14	0.16
28	2.3	7	0.02	0.14	0.16
	4.2	6	0.00	0.12	0.12
30	2.5	8	0.02	0.12	0.16
	3.5	7	0.02	0.12	0.12
32	2.6	9	0.02	0.12	0.16
	3.6	8	0.02	0.10	0.12
34	2.7	10	0.04	0.12	0.16
	4.5	9	0.02	0.08	0.10
36	2.8	12	0.04	0.12	0.16
	3.7	11	0.02	0.10	0.12
38	3.0	14	0.04	0.12	0.14
	3.9	13	0.02	0.08	0.10
39	3.0	15	0.04	0.12	0.16
	4.2	14	0.02	0.08	0.10
40	3.1	17	0.04	0.10	0.14
	3.2	16	0.04	0.10	0.14
	4.5	15	0.02	0.08	0.10
41	3.1	18	0.04	0.10	0.14
	3.6	17	0.04	0.10	0.12
	5.0	16	0.02	0.06	0.08
42	3.1	19	0.04	0.12	0.16
	4.0	18	0.02	0.08	0.10
43	3.2	21	0.04	0.10	0.14
	3.3	20	0.04	0.10	0.14
	4.5	19	0.02	0.06	0.10
44	3.3	22	0.04	0.10	0.14
	3.7	21	0.04	0.10	0.12
	4.9	20	0.02	0.14	0.16
45	3.3	23	0.04	0.10	0.14
	4.1	22	0.02	0.08	0.10

Bold indicates Maximum Calculated Surface Dose Rate and/or source term used for Design Basis Fuel

Table M.5-37
0.6 kW Fuel in the Transfer Cask (original FQT only)

Burnup (GWd/MTU)	Initial Enrichment (wt. % U-235)	Cooling Time (years)	Cask Centerline Side		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
20	2	5	3.98	2.66	6.64
25	2.1	6	9.14	3.76	12.90
	4.7	5	1.76	2.10	3.88
28	2.3	7	12.14	4.26	16.40
	4.2	6	3.74	2.26	5.98
30	2.5	8	13.54	4.40	17.94
	3.5	7	7.34	2.98	10.32
32	2.6	9	15.98	4.86	20.84
	3.6	8	8.90	3.18	12.08
34	2.7	10	18.58	5.40	23.98
	4.5	9	6.98	2.52	9.50
36	2.8	12	20.50	5.70	26.20
	3.7	11	12.68	3.80	16.48
38	3.0	14	21.14	5.72	26.86
	3.9	13	13.42	3.84	17.24
39	3.0	15	22.66	6.04	28.70
	4.2	14	12.46	3.54	15.98
40	3.1	17	22.06	5.80	27.86
	3.2	16	21.68	5.74	27.42
	4.5	15	11.62	3.26	14.88
41	3.1	18	23.50	6.12	29.62
	3.6	17	18.72	4.96	23.68
	5.0	16	9.96	2.82	12.78
42	3.1	19	24.96	6.44	31.40
	4.0	18	16.34	4.34	20.68
43	3.2	21	24.18	6.20	30.36
	3.3	20	23.82	6.14	29.94
	4.5	19	13.76	3.66	17.44
44	3.3	22	24.26	6.20	30.46
	3.7	21	20.62	5.32	25.92
	4.9	20	12.28	4.32	16.60
45	3.3	23	25.58	6.50	32.08
	4.1	22	18.02	4.64	22.66

Bold indicates Maximum Calculated Surface Dose Rate and/or source term used for Design Basis Fuel

Table M.5-38
16 Inner Assembly Response Function for HSM Roof Centerline

Response Function Parameter for	Lower Boundary of Energy Group, MeV	Upper Boundary of Energy Group, MeV	Middle of HSM Roof Centerline		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
Neutrons	0.00E+00	2.0E+01	1.60E-10	3.42E-10	5.02E-10
Group 40	0.00E+00	5.00E-02	0.00E+00	0.00E+00	0.00E+00
Group 39	5.00E-02	1.00E-01	0.00E+00	0.00E+00	0.00E+00
Group 38	1.00E-01	2.00E-01	0.00E+00	5.44E-33	5.44E-33
Group 37	2.00E-01	3.00E-01	0.00E+00	7.19E-27	7.19E-27
Group 36	3.00E-01	4.00E-01	0.00E+00	2.13E-23	2.13E-23
Group 35	4.00E-01	6.00E-01	0.00E+00	5.28E-22	5.28E-22
Group 34	6.00E-01	8.00E-01	0.00E+00	9.12E-20	9.12E-20
Group 33	8.00E-01	1.00E+00	0.00E+00	4.96E-18	4.96E-18
Group 32	1.00E+00	1.33E+00	0.00E+00	1.58E-16	1.58E-16
Group 31	1.33E+00	1.66E+00	0.00E+00	1.73E-15	1.73E-15
Group 30	1.66E+00	2.00E+00	0.00E+00	8.36E-15	8.36E-15
Group 29	2.00E+00	2.50E+00	0.00E+00	3.42E-14	3.42E-14
Group 28	2.50E+00	3.00E+00	0.00E+00	9.84E-14	9.84E-14
Group 27	3.00E+00	4.00E+00	0.00E+00	2.84E-13	2.84E-13
Group 26	4.00E+00	5.00E+00	0.00E+00	6.09E-13	6.09E-13
Group 25	5.00E+00	6.50E+00	0.00E+00	1.09E-12	1.09E-12
Group 24	6.50E+00	8.00E+00	0.00E+00	1.59E-12	1.59E-12
Group 23	8.00E+00	1.00E+01	0.00E+00	1.79E-12	1.79E-12

Table M.5-39
32 Assembly Response Function for HSM Roof Centerline

Response Function Parameter for	Lower Boundary of Energy Group, MeV	Upper Boundary of Energy Group, MeV	Middle of HSM Roof Centerline		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
Neutrons	0.00E+00	2.0E+01	7.68E-10	1.10E-09	1.87E-09
Group 40	0.00E+00	5.00E-02	0.00E+00	0.00E+00	0.00E+00
Group 39	5.00E-02	1.00E-01	0.00E+00	3.22E-35	3.22E-35
Group 38	1.00E-01	2.00E-01	0.00E+00	1.24E-21	1.24E-21
Group 37	2.00E-01	3.00E-01	0.00E+00	2.11E-19	2.11E-19
Group 36	3.00E-01	4.00E-01	0.00E+00	3.71E-18	3.71E-18
Group 35	4.00E-01	6.00E-01	0.00E+00	1.28E-16	1.28E-16
Group 34	6.00E-01	8.00E-01	0.00E+00	1.41E-15	1.41E-15
Group 33	8.00E-01	1.00E+00	0.00E+00	8.11E-15	8.11E-15
Group 32	1.00E+00	1.33E+00	0.00E+00	5.39E-14	5.39E-14
Group 31	1.33E+00	1.66E+00	0.00E+00	2.49E-13	2.49E-13
Group 30	1.66E+00	2.00E+00	0.00E+00	7.77E-13	7.77E-13
Group 29	2.00E+00	2.50E+00	0.00E+00	2.30E-12	2.30E-12
Group 28	2.50E+00	3.00E+00	0.00E+00	5.62E-12	5.62E-12
Group 27	3.00E+00	4.00E+00	0.00E+00	1.47E-11	1.47E-11
Group 26	4.00E+00	5.00E+00	0.00E+00	3.18E-11	3.18E-11
Group 25	5.00E+00	6.50E+00	0.00E+00	6.01E-11	6.01E-11
Group 24	6.50E+00	8.00E+00	0.00E+00	9.69E-11	9.69E-11
Group 23	8.00E+00	1.00E+01	0.00E+00	1.31E-10	1.31E-10

Table M.5-40
16 Outer Assembly Response Function for HSM Roof Centerline

Response Function Parameter for	Lower Boundary of Energy Group, MeV	Upper Boundary of Energy Group, MeV	Middle of HSM Roof Centerline		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
Neutrons	0.00E+00	2.0E+01	6.08E-10	7.63E-10	1.37E-09
Group 40	0.00E+00	5.00E-02	0.00E+00	0.00E+00	0.00E+00
Group 39	5.00E-02	1.00E-01	0.00E+00	4.93E-35	4.93E-35
Group 38	1.00E-01	2.00E-01	0.00E+00	1.44E-21	1.44E-21
Group 37	2.00E-01	3.00E-01	0.00E+00	2.13E-19	2.13E-19
Group 36	3.00E-01	4.00E-01	0.00E+00	3.71E-18	3.71E-18
Group 35	4.00E-01	6.00E-01	0.00E+00	1.28E-16	1.28E-16
Group 34	6.00E-01	8.00E-01	0.00E+00	1.41E-15	1.41E-15
Group 33	8.00E-01	1.00E+00	0.00E+00	8.11E-15	8.11E-15
Group 32	1.00E+00	1.33E+00	0.00E+00	5.37E-14	5.37E-14
Group 31	1.33E+00	1.66E+00	0.00E+00	2.47E-13	2.47E-13
Group 30	1.66E+00	2.00E+00	0.00E+00	7.69E-13	7.69E-13
Group 29	2.00E+00	2.50E+00	0.00E+00	2.27E-12	2.27E-12
Group 28	2.50E+00	3.00E+00	0.00E+00	5.52E-12	5.52E-12
Group 27	3.00E+00	4.00E+00	0.00E+00	1.44E-11	1.44E-11
Group 26	4.00E+00	5.00E+00	0.00E+00	3.12E-11	3.12E-11
Group 25	5.00E+00	6.50E+00	0.00E+00	5.90E-11	5.90E-11
Group 24	6.50E+00	8.00E+00	0.00E+00	9.53E-11	9.53E-11
Group 23	8.00E+00	1.00E+01	0.00E+00	1.29E-10	1.29E-10

Table M.5-41
16 Inner Assembly Response Function for TC Side Surface

Response Function Parameter for	Lower Boundary of Energy Group, MeV	Upper Boundary of Energy Group, MeV	Middle of TC Side Surface		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
Neutrons	0.00E+00	2.0E+01	2.41E-08	9.82E-08	1.22E-07
Group 40	0.00E+00	5.00E-02	0.00E+00	0.00E+00	0.00E+00
Group 39	5.00E-02	1.00E-01	0.00E+00	0.00E+00	0.00E+00
Group 38	1.00E-01	2.00E-01	0.00E+00	0.00E+00	0.00E+00
Group 37	2.00E-01	3.00E-01	0.00E+00	1.80E-35	1.80E-35
Group 36	3.00E-01	4.00E-01	0.00E+00	1.02E-31	1.02E-31
Group 35	4.00E-01	6.00E-01	0.00E+00	3.98E-24	3.98E-24
Group 34	6.00E-01	8.00E-01	0.00E+00	1.35E-19	1.35E-19
Group 33	8.00E-01	1.00E+00	0.00E+00	3.06E-17	3.06E-17
Group 32	1.00E+00	1.33E+00	0.00E+00	1.94E-15	1.94E-15
Group 31	1.33E+00	1.66E+00	0.00E+00	2.46E-14	2.46E-14
Group 30	1.66E+00	2.00E+00	0.00E+00	1.07E-13	1.07E-13
Group 29	2.00E+00	2.50E+00	0.00E+00	3.38E-13	3.38E-13
Group 28	2.50E+00	3.00E+00	0.00E+00	7.04E-13	7.04E-13
Group 27	3.00E+00	4.00E+00	0.00E+00	1.22E-12	1.22E-12
Group 26	4.00E+00	5.00E+00	0.00E+00	1.59E-12	1.59E-12
Group 25	5.00E+00	6.50E+00	0.00E+00	1.73E-12	1.73E-12
Group 24	6.50E+00	8.00E+00	0.00E+00	1.60E-12	1.60E-12
Group 23	8.00E+00	1.00E+01	0.00E+00	1.21E-12	1.21E-12

Table M.5-42
32 Assembly Response Function for TC Side Surface

Response Function Parameter for	Lower Boundary of Energy Group, MeV	Upper Boundary of Energy Group, MeV	Middle of TC Side Surface		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
Neutrons	0.00E+00	2.0E+01	3.86E-07	7.22E-08	4.58E-07
Group 40	0.00E+00	5.00E-02	0.00E+00	0.00E+00	0.00E+00
Group 39	5.00E-02	1.00E-01	0.00E+00	0.00E+00	0.00E+00
Group 38	1.00E-01	2.00E-01	0.00E+00	1.26E-44	1.26E-44
Group 37	2.00E-01	3.00E-01	0.00E+00	4.50E-28	4.50E-28
Group 36	3.00E-01	4.00E-01	0.00E+00	1.50E-26	1.50E-26
Group 35	4.00E-01	6.00E-01	0.00E+00	1.15E-18	1.15E-18
Group 34	6.00E-01	8.00E-01	0.00E+00	1.69E-15	1.69E-15
Group 33	8.00E-01	1.00E+00	0.00E+00	4.30E-14	4.30E-14
Group 32	1.00E+00	1.33E+00	0.00E+00	5.80E-13	5.80E-13
Group 31	1.33E+00	1.66E+00	0.00E+00	3.17E-12	3.17E-12
Group 30	1.66E+00	2.00E+00	0.00E+00	8.73E-12	8.73E-12
Group 29	2.00E+00	2.50E+00	0.00E+00	1.94E-11	1.94E-11
Group 28	2.50E+00	3.00E+00	0.00E+00	3.31E-11	3.31E-11
Group 27	3.00E+00	4.00E+00	0.00E+00	4.96E-11	4.96E-11
Group 26	4.00E+00	5.00E+00	0.00E+00	6.15E-11	6.15E-11
Group 25	5.00E+00	6.50E+00	0.00E+00	6.66E-11	6.66E-11
Group 24	6.50E+00	8.00E+00	0.00E+00	6.39E-11	6.39E-11
Group 23	8.00E+00	1.00E+01	0.00E+00	5.26E-11	5.26E-11

Table M.5-43
16 Outer Assembly Response Function for TC Side Surface

Response Function Parameter for	Lower Boundary of Energy Group, MeV	Upper Boundary of Energy Group, MeV	Middle of TC Side Surface		
			neutron (mrem/hr)	gamma (mrem/hr)	Total (mrem/hr)
Neutrons	0.00E+00	2.0E+01	2.88E-07	4.80E-08	3.36E-07
Group 40	0.00E+00	5.00E-02	0.00E+00	0.00E+00	0.00E+00
Group 39	5.00E-02	1.00E-01	0.00E+00	0.00E+00	0.00E+00
Group 38	1.00E-01	2.00E-01	0.00E+00	1.40E-44	1.40E-44
Group 37	2.00E-01	3.00E-01	0.00E+00	4.53E-28	4.53E-28
Group 36	3.00E-01	4.00E-01	0.00E+00	1.50E-26	1.50E-26
Group 35	4.00E-01	6.00E-01	0.00E+00	1.15E-18	1.15E-18
Group 34	6.00E-01	8.00E-01	0.00E+00	1.69E-15	1.69E-15
Group 33	8.00E-01	1.00E+00	0.00E+00	4.29E-14	4.29E-14
Group 32	1.00E+00	1.33E+00	0.00E+00	5.78E-13	5.78E-13
Group 31	1.33E+00	1.66E+00	0.00E+00	3.15E-12	3.15E-12
Group 30	1.66E+00	2.00E+00	0.00E+00	8.62E-12	8.62E-12
Group 29	2.00E+00	2.50E+00	0.00E+00	1.91E-11	1.91E-11
Group 28	2.50E+00	3.00E+00	0.00E+00	3.24E-11	3.24E-11
Group 27	3.00E+00	4.00E+00	0.00E+00	4.84E-11	4.84E-11
Group 26	4.00E+00	5.00E+00	0.00E+00	5.99E-11	5.99E-11
Group 25	5.00E+00	6.50E+00	0.00E+00	6.48E-11	6.48E-11
Group 24	6.50E+00	8.00E+00	0.00E+00	6.23E-11	6.23E-11
Group 23	8.00E+00	1.00E+01	0.00E+00	5.14E-11	5.14E-11

Table M.5-44
Dose Rate Limits for Expanded Fuel Qualification Table Entries

<i>Configuration</i>	<i>Decay Heat Limit Criteria, kW/FA</i>	<i>Assumed Number of FAs in Each Zone</i>	<i>Dose Rate Limits, mrem/hr</i>	
			<i>HSM</i>	<i>TC</i>
<i>1</i>	<i>0.63</i>	<i>16 Inner</i>	<i>0.39</i>	<i>90.49</i>
	<i>0.87</i>	<i>16 Outer</i>	<i>46.64</i>	<i>535.39</i>
	<i>--</i>	<i>Total</i>	<i>47.03</i>	<i>625.88</i>
<i>2</i>	<i>0.6</i>	<i>16 Inner</i>	<i>0.36</i>	<i>84.09</i>
	<i>1.2</i>	<i>16 Outer</i>	<i>46.66</i>	<i>541.79</i>
	<i>--</i>	<i>Total</i>	<i>47.03</i>	<i>625.88</i>
<i>3</i>	<i>0.7</i>	<i>32</i>	<i>47.03</i>	<i>625.88</i>

M.6.1 Discussion and Results

Figure M.6-1 shows the cross section of the NUHOMS®-32PT DSC. The NUHOMS®-32PT DSC stainless steel basket consists of a welded plate or tube design. The welded plates or tubes form 32 compartments with sufficient space to accommodate aluminum or poison/aluminum inserts and a PWR fuel assembly. The fuel compartment structure is connected to perimeter transition rail assemblies as shown on the drawings in Section M.1.5. The poison/aluminum plates and aluminum plates are located inside the fuel compartments. The poison plates may be arranged in any of the following configurations: a 20 poison plate configuration (base configuration), as shown in Figure M.6-1; an alternate 16 poison plate configuration, as shown in Figure M.6-13; and another alternate 24 poison plate configuration, as shown in Figure M.6-14. Figure M.6-2 through Figure M.6-4 show the fuel compartments that must contain PRAs for loading configurations that require four, eight or sixteen PRAs. The 20 poison plate basket configuration shown in Figure M.6-1 is analyzed as a Type A/B/C/D basket while the 24 poison plate basket configurations shown in Figure M.6-14 is analyzed as an Alternate Type A/B/C/D basket. The 16 poison plate basket configuration shown in Figure M.6-13 is also analyzed as an Alternate Type A basket.

The analysis presented herein is performed for a NUHOMS®-32PT DSC in the NUHOMS® OS197/197H Transfer Casks (TCs) during normal and accident loading conditions. The NUHOMS® OS197/197H TCs consists of an inner stainless steel shell, lead gamma shield, a stainless steel structural shell and a hydrogenous (liquid) neutron shield. This analysis is applicable to any licensed cask of similar construction. The NUHOMS®-32PT DSC/TC configuration is shown to be sub-critical under normal and accident conditions of loading, transfer and storage.

The criticality analysis determines the most reactive configuration for the basket and assembly location. Then criticality calculations evaluate a variety of fuel assembly types, initial enrichments and PRA configurations. Finally, the maximum allowed initial enrichment for each assembly type/PRA configuration is determined. The maximum allowed initial enrichment for each assembly type/PRA configuration is listed in Table M.6-1. The calculations determine k_{eff} with the CSAS25 control module of SCALE-4.4 [6-1] for each assembly type/PRA configuration and initial enrichment, including all uncertainties to assure criticality safety under all credible conditions.

The results of the evaluation presented include reconstituted fuel assemblies where fuel pins are replaced with up to 56 solid stainless steel rods or an unlimited number of lower enriched UO_2 rods of the same diameter as the fuel pins.

The results of the evaluation demonstrate that the maximum expected k_{eff} , including statistical uncertainty, will be less than the Upper Subcritical Limit (USL) determined from a statistical analysis of benchmark criticality experiments. The statistical analysis procedure includes a confidence band with an administrative safety margin of 0.05.

M.6.3 Model Specification

The following subsections describe the physical models and materials of the NUHOMS®-32PT DSC as loaded and transferred in the NUHOMS® OS197 or OS197H TC used for input to the CSAS25 module of SCALE-4.4 [6-1] to perform the criticality evaluation. The reactivity of canister under storage conditions is bounded by the TC analysis with zero internal moderator density case. The TC analysis with zero internal moderator density case bounds the storage conditions in the HSM because (1) the canister internals are always dry (purged and backfilled with He) while in the HSM, and (2) the TC contains materials such as steel and lead which provide close reflection of fast neutrons back into the fueled basket while the HSM materials (concrete) are much further from the sides of the DSC and thereby tend to reflect thermalized neutrons back to the canister which are absorbed in the canister materials reducing the system reactivity.

M.6.3.1 Description of Calculational Model

The TC and canister are explicitly modeled using the appropriate geometry options in KENO V.a of the CSAS25 module in SCALE-4.4. Several models are developed to evaluate the fabrication tolerances of the canister, basket, fuel clad outer diameter, fuel assembly locations, fuel assembly type, initial enrichments, PRA locations and storage of BPRAs with the B&W 15x15 and WE 17x17 assembly classes.

The first model is a full active-fuel height and full radial cross section of the canister and TC with reflective boundary conditions on the ends and sides. The model does not explicitly include the water neutron shield. However, the infinite array of TCs without the neutron shield does contain unborated water between the TCs. KENO plots of these models for each assembly class are included in Section M.6.6.2. This model is used to determine the most reactive fuel assembly for a given enrichment and without any PRAs, most reactive assembly-to-assembly pitch, and to determine the most reactive canister configuration accounting for manufacturing tolerances and fuel assembly clad outer diameter tolerances.

All calculations to determine the most reactive configuration are performed utilizing the configurations containing 20 poison plates. There is no change to the most reactive configuration due to a change in the number and orientation of the poison plates in the basket (16 poison plate and 24 poison plate configurations).

The second model is of the most reactive configuration identified above. This model is used to determine the maximum enrichment allowed for each assembly type as a function of the number of PRAs (none, four, eight and sixteen), *and boron loading*, as appropriate. In addition, the effect of BPRAs for the B&W 15x15 and WE 17x17 class assemblies for the various configurations are evaluated.

For all assembly classes, the maximum allowed enrichment is determined with 2500 ppm soluble boron concentration in the pool. For the CE 14x14, WE 14x14, and CE 15x15 assembly classes, the maximum allowed enrichment is also determined for a range of boron loadings in the pool (i.e., 1800-2500 ppm).

Figure M.6-5 is a sketch of each KENO V.a unit showing all materials and dimensions for each Unit and an annotated cross section map showing the assembled geometry units in the radial direction of the most reactive configuration identified in this evaluation. The bounding k_{eff} is calculated with a Westinghouse 17x17 LOPAR/Standard assembly with an initial enrichment of 3.4 wt. % U-235, with no PRAs and 32 BPRAs.

M.6.4.1.4 Determination of k_{eff}

The Monte Carlo calculations performed with CSAS25(KENO V.a) use a flat neutron starting distribution. The total number of histories traced for each calculation is approximately 500,000. This number of histories is sufficient to converge the source and produce standard deviations of less than 0.15% in k_{eff} . The maximum k_{eff} for the calculation is determined with the following formula:

$$k_{\text{eff}} = k_{\text{KENO}} + 2\sigma_{\text{KENO}}.$$

M.6.4.2 Fuel Loading Optimization

Determination of the Most Reactive Fuel Type

All fuel lattices listed in Table M.6-3 are evaluated to determine the most reactive fuel assembly type with initial enrichments of 3.3 wt. % U-235. The fuel types are analyzed with water in the fuel pellet cladding annulus and are centered in the fuel compartments of the 20 poison plate configuration. Nominal basket dimensions are used in the KENO models. The effect of moderator density is also evaluated using the most reactive fuel type, B&W 15x15 Mark B.

The canister/TC model for this evaluation differs from the actual design in the following ways:

- the boron-10 content in the poison plates is 10% lower than the minimum required,
- the neutron shield and the skin of the TC are conservatively replaced with water between the TCs, and
- the stainless steel and aluminum transition rails provide support to the fuel compartment grid are modeled as solid aluminum.

In all other respects, the model is the same as that described in Sections M.6.3.1 and M.6.1.1. KENO plots of these models are included in Section M.6.6.2.

Two typical input files are included in Section M.6.6.3, one without PRAs and one with four (4) PRAs. The results of these calculations are listed in Table M.6-6. The most reactive fuel type evaluated for the canister design for a given initial enrichment, without PRAs and without BPRAs, is the B&W 15x15 Mark B assembly.

Determination of the Most Reactive Configuration

The fuel-loading configuration of the canister/TC affects the reactivity of the package. Several series of analyses determine the most reactive configuration for the canister/TC.

For this analysis, the most reactive fuel type is used to determine the most reactive 20 poison plate configuration. The canister/TC is modeled over the active fuel height of the B&W 15x15 Mark B assembly with reflective boundary conditions on all sides. This represents an infinite array in the x-y direction of canisters/TCs that are conservatively infinite in length. The first model in this series of calculations is identical to the model used above. The canister/TC model for this evaluation differs from the actual design in the following ways:

- the boron-10 content in the poison plates is 10% lower than the minimum required,
- the stainless steel/aluminum transition rails provide support to the fuel compartment grid are modeled as various solid materials to determine the most reactive condition, and
- the neutron shield and the skin of the TC are conservatively replaced with water between the TCs.

Each evaluation is performed at 100% moderator density and again at 60% moderator density which is the most reactive moderator density as demonstrated by the results in Table M.6-6.

The first series of analyses examines the effect of the different materials used in the transition rails between the basket structure and canister shell on reactivity. The transition rails includes stainless steel and aluminum. Two cases with 2500 ppm borated water and pure water in the transition rail region are also included for completeness. The results in Table M.6-7 show a transition rail region filled with aluminum results in the most reactive condition. Therefore, all further analysis assumes solid aluminum in this region.

The second set of analysis evaluates the sensitivity of the system reactivity on fuel cladding OD. The model starts with the worst case above and the assembly cladding O.D. is varied from 0.420 to 0.440 inches. The results of this analysis demonstrate that cladding O.D. or thickness has a statistically insignificant effect on system reactivity. Therefore, the nominal clad thicknesses listed in Table M.6-3 are used for the balance of this evaluation. The results of the fuel clad OD evaluation are listed in Table M.6-8.

The third set of analyses evaluates the effect of neutron poison/aluminum plate thickness on the system reactivity. The model starts with the nominal clad OD model above. The poison plates consist of a poison/aluminum laminate. For this evaluation only the aluminum laminate thickness is varied. For the solid aluminum plate, the overall plate thickness is varied. Based on the results in Table M.6-9 the effect due to the variation in plate thickness is within the statistical uncertainty of the calculation. The nominal value, however, produced the maximum k_{eff} for both the 100 and 60% moderator density, where 60% moderator density represents the most reactive moderator density. Therefore, the nominal plate thickness is used for the balance of this evaluation.

The fourth set of analyses evaluates the effect of basket grid structure plate/tube thickness on reactivity. The model starts with the nominal poison/aluminum plate thickness above and the basket structure plate/tube thickness is varied from 0.235 to 0.26 inches. The results in Table M.6-10 show that the effect of basket structure plate/tube thickness has a statistically insignificant effect on reactivity. The most reactive calculated condition occurs with minimum basket structure plate/tube thickness because it allows the fuel assemblies to move slightly closer together. The balance of this evaluation uses the minimum basket structure plate/tube thickness because it represents the most reactive configuration.

plate/tube thickness, minimum fuel compartment width, minimum assembly-to-assembly pitch and uniform maximum planar enrichment. The following analysis uses this configuration to determine the maximum allowed initial enrichment as a function of initial enrichment and PRA configuration for each assembly class. All three poison plate configurations (20 poison plate configuration, 16 poison plate configuration and 24 poison plate configuration) are evaluated in these calculations. *Calculations at 2500 ppm boron are performed for all assembly classes. For the CE 14x14, WE 14x14, and CE 15x15 assembly classes, calculations are also performed for a range of boron loadings (1800-2500 ppm).* The most reactive assembly type for each assembly class is used for each evaluation. In addition, for each case the internal moderator density is varied to determine the peak reactivity for the specific configuration. The maximum initial enrichment for each assembly class and PRA configuration are provided in Table M.6-1.

The canister/TC model for this evaluation differs from the actual design in the following ways:

- the boron-10 content in the poison plates is 10% lower than the minimum required,
- the boron-10 content in the PRAs is 25% lower than the minimum required,
- the stainless steel/aluminum transition rails that provide support to the fuel compartment grid are modeled as various solid materials to determine the most reactive condition,
- BPRAs, when modeled, are modeled as solid $^{11}\text{B}_4\text{C}$ in the guide tubes and instrument tubes,
- the neutron shield and the skin of the TC are conservatively replaced with water between the TCs, and
- the worst case material conditions, as determined in Section M.6.4.2 above, are modeled.

The input file for the case with the highest calculated reactivity is included in Section M.6.6.4.

WE 17x17 Class Assemblies

The most reactive WE 17x17 class assembly is the WE 17x17 LOPAR/standard assembly as demonstrated in Table M.6-6. The results for the WE 17x17 class assembly calculations for the 20 poison plate configuration are listed in Table M.6-13 and Table M.6-14 for cases without and with BPRAs, respectively. The results for the WE 17x17 class assembly calculations for the 16 poison plate configuration are listed in Table M.6-27 and Table M.6-28 for cases without and with BPRAs, respectively. The results for the WE 17x17 class assembly calculations for the 24 poison plate configuration are listed in Table M.6-29 and Table M.6-30 for cases without and with BPRAs, respectively.

B&W 15x15 Class Assemblies

The most reactive B&W 15x15 class assembly is the B&W 15x15 Mark B assembly as demonstrated in Table M.6-6. The results for the B&W 15x15 class assembly calculations for the 20 poison plate configuration are listed in Table M.6-15 and Table M.6-16 for cases without and with BPRAs, respectively. The results for the B&W 15x15 class assembly calculations for the 16 poison plate configuration are listed in Table M.6-31 and Table M.6-32 for cases without and with BPRAs, respectively. The results for the B&W 15x15 class assembly calculations for the 24 poison plate configuration are listed in Table M.6-33 and Table M.6-34 for cases without and with BPRAs, respectively.

CE 15x15 Class Assemblies

The most reactive CE 15x15 class assembly is the CE 15x15 Palisades assembly as demonstrated in Table M.6-6. The results for the CE 15x15 class assembly calculations for the 20 poison plate configuration *as a function of boron loading* are listed in Table M.6-17 for cases without BPRAs. BPRAs are not authorized to be stored with CE 15x15 class assemblies.

The addition of plugging cluster assemblies, i.e., steel rods, into each of the eight guide tubes of a CE 15x15 class assembly reduces the maximum reactivity of the payload. The introduction of the steel rods displaces both moderator and soluble boron within the assemblies. The plugging clusters are assumed to extend approximately 1 inch into the top of the assembly's active fuel region, and the resulting change in the maximum reactivity is less than the statistical uncertainties of the calculations. To demonstrate the affect of displacing the borated water on system reactivity, CE 15x15 Palisades cases with the highest fuel enrichments and highest soluble boron loadings (2300, 2400, and 2500 ppm boron) were reevaluated with steel in the guide tubes. Two scenarios were evaluated: full length steel rods and 1 inch long steel rods. The calculated reactivity of the models are shown in Table M.6-44 and Table M.6-45 (the k_{KENO} and 1σ values in columns 2 and 3 are from Table M.6-17). As shown therein, the addition of plugging clusters reduces reactivity of the system regardless of the length of the plugging cluster. These results also apply to the 16 and 24 poison plate configurations.

The results for the CE 15x15 class assembly calculations for the 16 and 24 poison plate configurations *as a function of boron loading* are listed in Table M.6-41.

WE 15x15 Class Assemblies

The most reactive WE 15x15 class assembly is the WE 15x15 Standard assembly as demonstrated in Table M.6-6. The results for the WE 15x15 class assembly calculations for the 20 poison plate configuration are listed in Table M.6-18 for cases without BPRAs. BPRAs are not authorized to be stored with WE 15x15 class assemblies. The results for the WE 15x15 class assembly calculations for the 16 poison plate configuration are listed in Table M.6-36 for cases without BPRAs. The results for the WE 15x15 class assembly calculations for the 24 poison plate configuration are listed in Table M.6-37 for cases without BPRAs.

CE 14x14 Class Assemblies

The most reactive CE 14x14 class assembly is the CE 14x14 Fort Calhoun assembly as demonstrated in Table M.6-6. The results for the CE 14x14 class assembly calculations for the 20 poison plate configuration *as a function of boron loading* are listed in M.6-19 for cases without BPRAs. BPRAs are not authorized to be stored with CE 14x14 class assemblies.

The results for the CE 14x14 class assembly calculations for the 16 *and* 24 poison plate configurations *as a function of boron loading* are listed in Table M.6-42.

WE 14x14 Class Assemblies

The most reactive WE 14x14 class assembly is the WE 14x14 ZCA/ZCB assembly as demonstrated in Table M.6-6. The results for the WE 14x14 class assembly calculations for the 20 poison plate configuration *as a function of boron loading* are listed in Table M.6-20 for cases without BPRAs. BPRAs are not authorized to be stored with WE 14x14 class assemblies.

The results for the WE 14x14 class assembly calculations for the 16 *and* 24 poison plate configurations *as a function of boron loading* are listed in Table M.6-43.

M.6.4.5 Criticality Results

Table M.6-21 lists the bounding results for all conditions of storage. The highest calculated k_{eff} , including 2σ uncertainty, is for the WE 14x14 assembly in the 20 poison plate configuration with an initial U-235 enrichment of 3.85 wt. %, no PRAs, 2000 ppm boron, and 60% moderator density. The maximum allowed initial enrichment for each assembly type/PRA configuration is listed in Table M.6-1.

These criticality calculations were performed with CSAS25 of SCALE-4.4. For each case, the result includes (1) the KENO-calculated k_{KENO} , (2) the one sigma uncertainty σ_{KENO} , and (3) the final k_{eff} , which is equal to $k_{\text{KENO}} + 2\sigma_{\text{KENO}}$.

The criterion for subcriticality is that

$$k_{\text{KENO}} + 2\sigma_{\text{KENO}} \leq \text{USL},$$

where USL is the upper subcritical limit established by an analysis of benchmark criticality experiments. From Section M.6.5, the minimum USL over the parameter range is 0.9411. From Table M.6-21 for the most reactive case,

$$k_{\text{KENO}} + 2\sigma_{\text{KENO}} = 0.9388 + 2(0.0011) = 0.9410 \leq 0.9411.$$

Table M.6-1
Maximum Initial Enrichment For Each Configuration, wt. % U-235

Assembly Class and Type	Soluble Boron Loading (ppm)	No PRAs (Type A)			4 PRAs (Type B)		8 PRAs (Type C)		16 PRAs (Type D)	
		Poison Plate Configuration			Poison Plate Configuration		Poison Plate Configuration		Poison Plate Configuration	
		16	20	24	20	24	20	24	20	24
<i>WE 17x17 Fuel Assembly⁽¹⁾</i> <i>Westinghouse 17x17 LOPAR/Standard</i> <i>Westinghouse 17x17 OFA/Vantage 5, +⁽²⁾</i>	2500	3.40	3.40	3.40	4.00	4.00	4.50	4.50	5.00	5.00
<i>B&W 15x15 Mark B Fuel Assembly⁽¹⁾</i>	2500	3.30	3.30	3.30	3.90	3.90	NA	NA	5.00	5.00
<i>WE 15x15 Fuel Assembly</i> <i>Westinghouse 15x15 Standard/ZC</i> <i>Exxon/ANF 15x15 WE</i>	2500	3.40	3.40	3.40	4.00	4.00	4.60	4.60	5.00	5.00
<i>CE 14x14 Fuel Assembly</i> <i>CE 14x14 Standard/Generic</i> <i>CE 14x14 Fort Calhoun</i>	1800	3.35	3.40	3.50	3.90	4.00	4.35	4.35	NA	NA
	2000	3.50	3.60	3.70	4.10	4.20	4.55	4.55	NA	NA
	2100	3.60	3.65	3.80	4.20	4.30	4.70	4.70	NA	NA
	2200	3.70	3.75	3.90	4.30	4.40	4.80	4.80	NA	NA
	2300	3.75	3.85	4.00	4.40	4.50	4.90	4.90	NA	NA
	2400	3.80	3.90	4.05	4.50	4.60	5.00	5.00	NA	NA
	2500	3.90	4.05	4.15	4.55	4.70	-	-	NA	NA
<i>WE 14x14 Fuel Assembly</i> <i>Westinghouse 14x14 ZCA/ZCB</i> <i>Westinghouse 14x14 OFA</i> <i>Exxon/ANF 14x14 WE</i>	1800	3.55	3.65	3.75	4.25	4.40	NA	NA	NA	NA
	2000	3.75	3.85	3.90	4.50	4.60	NA	NA	NA	NA
	2100	3.80	3.95	4.00	4.60	4.75	NA	NA	NA	NA
	2200	3.90	4.00	4.10	4.70	4.85	NA	NA	NA	NA
	2300	4.00	4.10	4.20	4.85	5.00	NA	NA	NA	NA
	2400	4.10	4.20	4.30	4.95	-	NA	NA	NA	NA
	2500	4.15	4.25	4.40	5.00	-	NA	NA	NA	NA
<i>CE 15x15 Fuel Assembly</i> <i>CE 15x15 Palisades</i> <i>Exxon/ANF 15x15 CE</i>	1800	3.00	3.15	3.15	NA	NA	NA	NA	NA	NA
	2000	3.15	3.30	3.30	NA	NA	NA	NA	NA	NA
	2100	3.20	3.35	3.40	NA	NA	NA	NA	NA	NA
	2200	3.30	3.45	3.50	NA	NA	NA	NA	NA	NA
	2300	3.35	3.50	3.55	NA	NA	NA	NA	NA	NA
	2400	3.40	3.60	3.60	NA	NA	NA	NA	NA	NA
	2500	3.50	3.65	3.70	NA	NA	NA	NA	NA	NA

NOTES: (1) With or without BPRAs in locations without PRAs
(2) Includes all Vantage versions (5, +, ++, etc.).

**Table M.6-3
Parameters For PWR Assemblies⁽³⁾**

Manufacturer ⁽¹⁾	Array	Version	Active Fuel Length (in)	Number Fuel Rods per Assembly	Pitch (in)	Fuel Pellet OD (in)
WE	17x17	LOPAR	144	264	0.496	0.3225
WE	17x17	OFA/Van 5	144	264	0.496	0.3088
B&W	15x15	Mark B	141.8	208	0.568	0.3686
CE ⁽⁴⁾	15x15	Palisades	132	216 ⁽⁴⁾	0.550	0.3580
Exxon/ANF	15x15	CE	131.8	216	0.550	0.3565
Exxon/ANF	15x15	WE	144	204	0.563	0.3565
WE	15x15	Std/ZC	144	204	0.563	0.3559
CE	14x14	Std/Gen	137	176	0.580	0.3765
CE	14x14	Ft. Calhoun	128	176	0.580	0.3815
Exxon/ANF	14x14	WE	142	179	0.556	0.3505
WE	14x14	ZCA/ZCB	144	179	0.556	0.3659
WE	14x14	OFA	144	179	0.556	0.3444

Manufacturer ⁽¹⁾	Array	Version	Clad Thickness (in)	Clad OD (in)	Guide Tube OD (in)	Instrument Tube ID (in)
WE	17x17	LOPAR	0.0225	0.374	24@0.474 1@0.480	24@0.422 1@0.450
WE	17x17	OFA/Van 5	0.0225	0.360	24@0.482 1@0.476	24@0.450 1@0.460
B&W	15x15	Mark B	0.0265	0.430	16@0.530 1@0.493	16@0.498 1@0.441
CE	15x15	Palisades	0.0260	0.418	8@0.4135	8@0.3655
Exxon/ANF	15x15	CE	0.0300	0.417	8Guide Bars ⁽²⁾ 1@0.417	1@0.363
Exxon/ANF	15x15	WE	0.0300	0.424	20@0.544 1@0.544	20@0.510 1@0.510
WE	15x15	Std/ZC	0.0242	0.422	20@0.546 1@0.546	20@0.512 1@0.512
CE	14x14	Std/Gen	0.0280	0.440	5@1.115	5@1.035
CE	14x14	Ft. Calhoun	0.0280	0.440	5@1.115	5@1.035
Exxon/ANF	14x14	WE	0.0300	0.424	16@0.541 1@0.480	16@0.507 1@0.448
WE	14x14	ZCA/ZCB	0.0225	0.422	16@0.539 1@0.422	16@0.505 1@0.392
WE	14x14	OFA	0.0243	0.400	16@0.526 1@0.400	16@0.492 1@0.353

NOTES:

- (1) Reload fuel from other manufacturers with these parameters are also acceptable.
- (2) Guide Bars are solid Zircaloy-4 approximately 0.40 inches x 0.45 inches
- (3) All dimensions shown are nominal
- (4) CE 15x15 assemblies with 208 fuel rods and a stainless steel plugging cluster installed in each of the 8 guide tubes are also acceptable.

**Table M.6-5
Material Property Data**

Material	Density g/cm ³	Element	Weight %	Atom Density (atoms/b-cm)
UO ₂ (Enrichment - 3.4 wt%)	10.52	U-235	3.00	8.0797E-04
		U-238	85.15	2.2666E-02
		O	11.85	4.6948E-02
UO ₂ (Enrichment - 5.0 wt%)	10.52	U-235	4.41	1.1882E-03
		U-238	83.73	2.2290E-02
		O	11.86	4.6956E-02
Zircaloy-4	6.56	Zr	98.23	4.2541E-02
		Sn	1.45	4.8254E-04
		Fe	0.21	1.4856E-04
		Cr	0.10	7.5978E-05
		Hf	0.01	2.2133E-06
Borated Water (2500 ppm Boron)	1.000	H	0.11	6.6769E-02
		O	0.89	3.3385E-02
		B-10	4.602E-04	2.7713E-05
		B-11	2.038E-03	1.1155E-04
Water	0.998	H	11.1	6.6769E-02
		O	88.9	3.3385E-02
Stainless Steel (SS304)	7.94	C	0.080	3.1877E-04
		Si	1.000	1.7025E-03
		P	0.045	6.9468E-05
		Cr	19.000	1.7473E-02
		Mn	2.000	1.7407E-03
		Fe	68.375	5.8545E-02
		Ni	9.500	7.7402E-03
Aluminum	2.70	Al	100.0	6.0307E-02
Lead	11.34	Pb	100.0	3.2969E-02
Aluminum - Boron Poison Plate (0.0063 g/cm ² B-10)	2.465 ⁽¹⁾	B-10	1.34	1.9847E-03
		Al	98.66	5.4276E-02
B ₄ C in PRA	0.756	B-10	14.42	6.5599E-03
		B-11	63.83	2.6405E-02
		C	21.75	8.2411E-03
¹¹ B ₄ C in BPRA	2.555	B-11	78.56	1.0988E-01
		C	21.44	2.7470E-02

Note:

- (1) *Note in some models the aluminum-boron poison is modeled with a density of 2.693 g/cm³ (see the sample input in Section M.6.6.5), although the number density of B-10 is equivalent.*

Table M.6-13
**WE 17x17 Class Assembly without BPRAs Results (20 Poison Plate Configuration,
2500 ppm Soluble Boron Concentration)**

Model Description	k_{KENO}	1σ	k_{eff}
Initial Enrichment 3.4 wt% U-235 - No PRAs, w/o BPRAs			
Internal Moderator at 100%TD	0.9099	0.0008	0.9115
Internal Moderator at 90%TD	0.9216	0.0009	0.9234
Internal Moderator at 80%TD	0.9313	0.0009	0.9331
Internal Moderator at 70%TD	0.9355	0.0010	0.9375
Internal Moderator at 60%TD	0.9369	0.0009	0.9387
Internal Moderator at 50%TD	0.9282	0.0008	0.9298
Internal Moderator at 40%TD	0.9115	0.0008	0.9131
Initial Enrichment 4.0 wt% U-235 - 4 PRAs, w/o BPRAs			
Internal Moderator at 100%TD	0.9201	0.0008	0.9217
Internal Moderator at 90%TD	0.9269	0.0008	0.9285
Internal Moderator at 80%TD	0.9322	0.0009	0.9340
Internal Moderator at 70%TD	0.9333	0.0009	0.9351
Internal Moderator at 60%TD	0.9263	0.0009	0.9281
Internal Moderator at 50%TD	0.9151	0.0009	0.9169
Internal Moderator at 40%TD	0.8913	0.0008	0.8929
Initial Enrichment 4.5 wt% U-235 - 8 PRAs, w/o BPRAs			
Internal Moderator at 100%TD	0.9262	0.0008	0.9278
Internal Moderator at 90%TD	0.9313	0.0009	0.9331
Internal Moderator at 80%TD	0.9386	0.0009	0.9404
Internal Moderator at 70%TD	0.9357	0.0010	0.9377
Internal Moderator at 60%TD	0.9283	0.0010	0.9303
Internal Moderator at 50%TD	0.9110	0.0011	0.9132
Internal Moderator at 40%TD	0.8855	0.0009	0.8873
Initial Enrichment 5.0 wt% U-235 - 16 PRAs, w/o BPRAs			
Internal Moderator at 100%TD	0.9028	0.0009	0.9046
Internal Moderator at 90%TD	0.9026	0.0010	0.9046
Internal Moderator at 80%TD	0.8986	0.0011	0.9008
Internal Moderator at 70%TD	0.8871	0.0010	0.8891
Internal Moderator at 60%TD	0.8737	0.0011	0.8759
Internal Moderator at 50%TD	0.8505	0.0009	0.8523
Internal Moderator at 40%TD	0.8193	0.0010	0.8213

Table M.6-14
**WE 17x17 Class Assembly with BPRAs Results (20 Poison Plate Configuration,
2500 ppm Soluble Boron Concentration)**

Model Description	k _{KENO}	1 σ	k _{eff}
Initial Enrichment 3.4 wt% U-235 - No PRAs, with BPRAs			
Internal Moderator at 100%TD	0.9256	0.0008	0.9272
Internal Moderator at 90%TD	0.9342	0.0009	0.9360
Internal Moderator at 80%TD	0.9385	0.0009	0.9403
Internal Moderator at 70%TD	0.9389	0.0010	0.9409
Internal Moderator at 60%TD	0.9357	0.0008	0.9373
Internal Moderator at 50%TD	0.9236	0.0011	0.9258
Internal Moderator at 40%TD	0.9017	0.0009	0.9035
Internal Moderator at 0%TD	0.5821	0.0005	0.5831
Initial Enrichment 4.0 wt% U-235 - 4 PRAs, with BPRAs			
Internal Moderator at 100%TD	0.9317	0.0009	0.9335
Internal Moderator at 90%TD	0.9347	0.0010	0.9367
Internal Moderator at 80%TD	0.9357	0.0009	0.9375
Internal Moderator at 70%TD	0.9314	0.0008	0.9330
Internal Moderator at 60%TD	0.9240	0.0009	0.9258
Internal Moderator at 50%TD	0.9075	0.0009	0.9093
Internal Moderator at 40%TD	0.8830	0.0009	0.8848
Initial Enrichment 4.5 wt% U-235 - 8 PRAs, with BPRAs			
Internal Moderator at 100%TD	0.9339	0.0009	0.9357
Internal Moderator at 90%TD	0.9368	0.0011	0.9390
Internal Moderator at 80%TD	0.9338	0.0009	0.9356
Internal Moderator at 70%TD	0.9257	0.0009	0.9275
Internal Moderator at 60%TD	0.9123	0.0010	0.9143
Internal Moderator at 50%TD	0.8932	0.0011	0.8954
Internal Moderator at 40%TD	0.8656	0.0010	0.8676
Initial Enrichment 5.0 wt% U-235 - 16 PRAs, with BPRAs			
Internal Moderator at 100%TD	0.9029	0.0010	0.9049
Internal Moderator at 90%TD	0.8982	0.0010	0.9002
Internal Moderator at 80%TD	0.8900	0.0010	0.8920
Internal Moderator at 70%TD	0.8785	0.0010	0.8805
Internal Moderator at 60%TD	0.8593	0.0011	0.8615
Internal Moderator at 50%TD	0.8359	0.0012	0.8383
Internal Moderator at 40%TD	0.8031	0.0008	0.8047

Table M.6-15
**B&W 15x15 Class Assembly without BPRAs Results (20 Poison Plate Configuration,
 2500 ppm Soluble Boron Concentration)**

Model Description	k _{KENO}	1 σ	k _{eff}
Initial Enrichment 3.3 wt% U-235 - No PRAs, w/o BPRAs			
Internal Moderator at 100%TD	0.9030	0.0009	0.9048
Internal Moderator at 90%TD	0.9152	0.0009	0.9170
Internal Moderator at 80%TD	0.9249	0.0008	0.9265
Internal Moderator at 70%TD	0.9331	0.0009	0.9349
Internal Moderator at 60%TD	0.9317	0.0009	0.9335
Internal Moderator at 50%TD	0.9239	0.0009	0.9257
Internal Moderator at 40%TD	0.9078	0.0008	0.9094
Internal Moderator at 30%TD	0.8735	0.0009	0.8753
Internal Moderator at 20%TD	0.8132	0.0009	0.8150
Internal Moderator at 10%TD	0.7178	0.0007	0.7192
Internal Moderator at 0%TD	0.5676	0.0006	0.5688
Initial Enrichment 3.9 wt% U-235 - 4 PRAs, w/o BPRAs			
Internal Moderator at 100%TD	0.9200	0.0009	0.9218
Internal Moderator at 90%TD	0.9293	0.0010	0.9313
Internal Moderator at 80%TD	0.9330	0.0010	0.9350
Internal Moderator at 70%TD	0.9351	0.0010	0.9371
Internal Moderator at 60%TD	0.9326	0.0008	0.9342
Internal Moderator at 50%TD	0.9195	0.0009	0.9213
Internal Moderator at 40%TD	0.8985	0.0008	0.9001
Initial Enrichment 5.0 wt% U-235 - 16 PRAs, w/o BPRAs			
Internal Moderator at 100%TD	0.9189	0.0010	0.9209
Internal Moderator at 90%TD	0.9202	0.0010	0.9222
Internal Moderator at 80%TD	0.9176	0.0009	0.9194
Internal Moderator at 70%TD	0.9095	0.0011	0.9117
Internal Moderator at 60%TD	0.8953	0.0009	0.8971
Internal Moderator at 50%TD	0.8769	0.0010	0.8789
Internal Moderator at 40%TD	0.8450	0.0009	0.8468

Table M.6-16
**B&W 15x15 Class Assembly with BPRAs Results (20 Poison Plate Configuration,
2500 ppm Soluble Boron Concentration)**

Model Description	k_{KENO}	1σ	k_{eff}
Initial Enrichment 3.3 wt% U-235 - No PRAs, with BPRAs			
Internal Moderator at 100%TD	0.9182	0.0009	0.9200
Internal Moderator at 90%TD	0.9272	0.0010	0.9292
Internal Moderator at 80%TD	0.9332	0.0008	0.9348
Internal Moderator at 70%TD	0.9360	0.0009	0.9378
Internal Moderator at 60%TD	0.9341	0.0010	0.9361
Internal Moderator at 50%TD	0.9213	0.0010	0.9233
Internal Moderator at 40%TD	0.9002	0.0008	0.9018
Initial Enrichment 3.9 wt% U-235 - 4 PRAs, with BPRAs			
Internal Moderator at 100%TD	0.9313	0.0008	0.9329
Internal Moderator at 90%TD	0.9382	0.0009	0.9400
Internal Moderator at 80%TD	0.9389	0.0009	0.9407
Internal Moderator at 70%TD	0.9364	0.0008	0.9380
Internal Moderator at 60%TD	0.9294	0.0009	0.9312
Internal Moderator at 50%TD	0.9139	0.0009	0.9157
Internal Moderator at 40%TD	0.8878	0.0008	0.8894
Initial Enrichment 5.0 wt% U-235 - 16 PRAs, with BPRAs			
Internal Moderator at 100%TD	0.9243	0.0010	0.9263
Internal Moderator at 90%TD	0.9228	0.0010	0.9248
Internal Moderator at 80%TD	0.9160	0.0014	0.9188
Internal Moderator at 70%TD	0.9050	0.0010	0.9070
Internal Moderator at 60%TD	0.8886	0.0008	0.8902
Internal Moderator at 50%TD	0.8683	0.0008	0.8699
Internal Moderator at 40%TD	0.8358	0.0009	0.8376

Table M.6-17
CE 15x15 Class Assembly without BPRAs Results (20 Poison Plate Configuration, Variable Soluble Boron Concentration)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
<i>CE 15x15 Palisades, 1800ppm Boron, 3.15wt% U-235, no PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9259</i>	<i>0.0007</i>	<i>0.9273</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9327</i>	<i>0.0008</i>	<i>0.9342</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9374</i>	<i>0.0008</i>	<i>0.9390</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9390</i>	<i>0.0008</i>	<i>0.9406</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9345</i>	<i>0.0008</i>	<i>0.9361</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9226</i>	<i>0.0008</i>	<i>0.9241</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9006</i>	<i>0.0007</i>	<i>0.9020</i>
<i>CE 15x15 Palisades, 2000ppm Boron, 3.3wt% U-235, no PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9206</i>	<i>0.0009</i>	<i>0.9223</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9319</i>	<i>0.0010</i>	<i>0.9339</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9354</i>	<i>0.0009</i>	<i>0.9372</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9391</i>	<i>0.0009</i>	<i>0.9409</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9364</i>	<i>0.0010</i>	<i>0.9383</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9268</i>	<i>0.0009</i>	<i>0.9286</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9045</i>	<i>0.0010</i>	<i>0.9066</i>
<i>CE 15x15 Palisades, 2100ppm Boron, 3.35wt% U-235, no PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9164</i>	<i>0.0009</i>	<i>0.9183</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9257</i>	<i>0.0011</i>	<i>0.9278</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9326</i>	<i>0.0010</i>	<i>0.9346</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9372</i>	<i>0.0010</i>	<i>0.9391</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9344</i>	<i>0.0008</i>	<i>0.9360</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9235</i>	<i>0.0009</i>	<i>0.9253</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9065</i>	<i>0.0009</i>	<i>0.9083</i>
<i>CE 15x15 Palisades, 2200ppm Boron, 3.45wt% U-235, no PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9164</i>	<i>0.0008</i>	<i>0.9181</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9260</i>	<i>0.0009</i>	<i>0.9277</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9350</i>	<i>0.0008</i>	<i>0.9367</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9377</i>	<i>0.0009</i>	<i>0.9396</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9375</i>	<i>0.0009</i>	<i>0.9394</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9275</i>	<i>0.0009</i>	<i>0.9293</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9087</i>	<i>0.0009</i>	<i>0.9105</i>

Table M.6-17
CE 15x15 Class Assembly without BPRAs Results (20 Poison Plate Configuration, Variable Soluble Boron Concentration)
(concluded)

<i>CE 15x15 Palisades, 2300ppm Boron, 3.5wt% U-235, no PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9140</i>	<i>0.0010</i>	<i>0.9161</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9236</i>	<i>0.0009</i>	<i>0.9255</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9322</i>	<i>0.0008</i>	<i>0.9338</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9360</i>	<i>0.0010</i>	<i>0.9380</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9362</i>	<i>0.0011</i>	<i>0.9384</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9277</i>	<i>0.0010</i>	<i>0.9296</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9089</i>	<i>0.0010</i>	<i>0.9108</i>
<i>CE 15x15 Palisades, 2400ppm Boron, 3.6wt% U-235, no PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9133</i>	<i>0.0008</i>	<i>0.9149</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9237</i>	<i>0.0009</i>	<i>0.9255</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9310</i>	<i>0.0008</i>	<i>0.9327</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9383</i>	<i>0.0009</i>	<i>0.9400</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9359</i>	<i>0.0009</i>	<i>0.9376</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9305</i>	<i>0.0008</i>	<i>0.9322</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9138</i>	<i>0.0009</i>	<i>0.9157</i>
<i>CE 15x15 Palisades, 2500ppm Boron, 3.65wt% U-235, no PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9080</i>	<i>0.0008</i>	<i>0.9095</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9203</i>	<i>0.0009</i>	<i>0.9221</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9293</i>	<i>0.0008</i>	<i>0.9309</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9359</i>	<i>0.0010</i>	<i>0.9379</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9366</i>	<i>0.0009</i>	<i>0.9384</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9305</i>	<i>0.0010</i>	<i>0.9325</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9128</i>	<i>0.0008</i>	<i>0.9145</i>

Table M.6-18
**WE 15x15 Class Assembly without BPRAs Results (20 Poison Plate Configuration,
2500 ppm Soluble Boron Concentration)**

Model Description	k _{KENO}	1 σ	k _{eff}
Initial Enrichment 3.4 wt% U-235 - No PRAs, w/o BPRAs			
Internal Moderator at 100%TD	0.9016	0.0009	0.9034
Internal Moderator at 90%TD	0.9149	0.0009	0.9167
Internal Moderator at 80%TD	0.9255	0.0008	0.9271
Internal Moderator at 70%TD	0.9328	0.0009	0.9346
Internal Moderator at 60%TD	0.9364	0.0009	0.9382
Internal Moderator at 50%TD	0.9308	0.0010	0.9328
Internal Moderator at 40%TD	0.9133	0.0008	0.9149
Initial Enrichment 4.0 wt% U-235 - 4 PRAs, w/o BPRAs			
Internal Moderator at 100%TD	0.9107	0.0009	0.9125
Internal Moderator at 90%TD	0.9229	0.0010	0.9249
Internal Moderator at 80%TD	0.9292	0.0010	0.9312
Internal Moderator at 70%TD	0.9307	0.0009	0.9325
Internal Moderator at 60%TD	0.9278	0.0009	0.9296
Internal Moderator at 50%TD	0.9183	0.0009	0.9201
Internal Moderator at 40%TD	0.8959	0.0008	0.8975
Initial Enrichment 4.6 wt% U-235 - 8 PRAs, w/o BPRAs			
Internal Moderator at 100%TD	0.9276	0.0009	0.9294
Internal Moderator at 90%TD	0.9325	0.0009	0.9343
Internal Moderator at 80%TD	0.9363	0.0010	0.9383
Internal Moderator at 70%TD	0.9349	0.0008	0.9365
Internal Moderator at 60%TD	0.9251	0.0009	0.9269
Internal Moderator at 50%TD	0.9130	0.0009	0.9148
Internal Moderator at 40%TD	0.8863	0.0010	0.8883
Initial Enrichment 5.0 wt% U-235 - 16 PRAs, w/o BPRAs			
Internal Moderator at 100%TD	0.8969	0.0012	0.8993
Internal Moderator at 90%TD	0.8985	0.0011	0.9007
Internal Moderator at 80%TD	0.8967	0.0010	0.8987
Internal Moderator at 70%TD	0.8894	0.0009	0.8912
Internal Moderator at 60%TD	0.8780	0.0009	0.8798
Internal Moderator at 50%TD	0.8567	0.0010	0.8587
Internal Moderator at 40%TD	0.8259	0.0009	0.8277

Table M.6-19
CE 14x14 Class Assembly without BPRAs with Variable Soluble Boron Concentration
Results (20 Poison Plate Configuration)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
<i>CE 14x14 Fort Calhoun, 1800 ppm Boron, 3.4wt% U-235, no PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9011</i>	<i>0.0009</i>	<i>0.9029</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9158</i>	<i>0.0009</i>	<i>0.9176</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9237</i>	<i>0.0011</i>	<i>0.9259</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9338</i>	<i>0.0010</i>	<i>0.9359</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9355</i>	<i>0.0009</i>	<i>0.9372</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9287</i>	<i>0.0010</i>	<i>0.9307</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9118</i>	<i>0.0008</i>	<i>0.9135</i>
<i>CE 14x14 Fort Calhoun, 1800ppm Boron, 3.90wt% U-235, 4 PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9231</i>	<i>0.0011</i>	<i>0.9254</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9331</i>	<i>0.0010</i>	<i>0.9351</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9350</i>	<i>0.0009</i>	<i>0.9367</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9368</i>	<i>0.0009</i>	<i>0.9386</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9340</i>	<i>0.0008</i>	<i>0.9357</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9209</i>	<i>0.0009</i>	<i>0.9227</i>
<i>Internal Moderator at 40% TD</i>	<i>0.8959</i>	<i>0.0009</i>	<i>0.8976</i>
<i>CE 14x14 Fort Calhoun, 1800 ppm Boron, 4.35wt% U-235, 8 PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9292</i>	<i>0.0009</i>	<i>0.9311</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9359</i>	<i>0.0009</i>	<i>0.9378</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9365</i>	<i>0.0010</i>	<i>0.9385</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9348</i>	<i>0.0009</i>	<i>0.9367</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9277</i>	<i>0.0011</i>	<i>0.9298</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9125</i>	<i>0.0009</i>	<i>0.9143</i>
<i>Internal Moderator at 40% TD</i>	<i>0.8853</i>	<i>0.0010</i>	<i>0.8874</i>
<i>CE 14x14 Fort Calhoun, 2000 ppm Boron, 3.6wt% U-235, no PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.8967</i>	<i>0.0009</i>	<i>0.8985</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9117</i>	<i>0.0010</i>	<i>0.9137</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9250</i>	<i>0.0009</i>	<i>0.9268</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9359</i>	<i>0.0011</i>	<i>0.9380</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9369</i>	<i>0.0011</i>	<i>0.9391</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9342</i>	<i>0.0010</i>	<i>0.9362</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9186</i>	<i>0.0009</i>	<i>0.9203</i>

Table M.6-19
CE 14x14 Class Assembly without BPRAs with Variable Soluble Boron Concentration Results
(20 Poison Plate Configuration)
(continued)

CE 14x14 Fort Calhoun, 2000ppm Boron, 4.1wt% U-235, 4 PRAs			
<i>Internal Moderator at 100% TD</i>	<i>0.9196</i>	<i>0.0010</i>	<i>0.9216</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9292</i>	<i>0.0010</i>	<i>0.9312</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9359</i>	<i>0.0009</i>	<i>0.9377</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9385</i>	<i>0.0010</i>	<i>0.9405</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9356</i>	<i>0.0010</i>	<i>0.9376</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9252</i>	<i>0.0011</i>	<i>0.9274</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9010</i>	<i>0.0009</i>	<i>0.9027</i>
CE 14x14 Fort Calhoun, 2000ppm Boron, 4.55wt% U-235, 8 PRAs			
<i>Internal Moderator at 100% TD</i>	<i>0.9243</i>	<i>0.0009</i>	<i>0.9261</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9303</i>	<i>0.0010</i>	<i>0.9322</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9344</i>	<i>0.0009</i>	<i>0.9361</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9360</i>	<i>0.0009</i>	<i>0.9378</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9278</i>	<i>0.0010</i>	<i>0.9298</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9137</i>	<i>0.0011</i>	<i>0.9160</i>
<i>Internal Moderator at 40% TD</i>	<i>0.8878</i>	<i>0.0009</i>	<i>0.8895</i>
CE 14x14 Fort Calhoun, 2100ppm Boron, 3.65wt% U-235, no PRAs			
<i>Internal Moderator at 100% TD</i>	<i>0.8901</i>	<i>0.0009</i>	<i>0.8920</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9060</i>	<i>0.0011</i>	<i>0.9081</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9186</i>	<i>0.0009</i>	<i>0.9204</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9295</i>	<i>0.0010</i>	<i>0.9314</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9347</i>	<i>0.0010</i>	<i>0.9367</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9326</i>	<i>0.0009</i>	<i>0.9344</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9172</i>	<i>0.0010</i>	<i>0.9193</i>
CE 14x14 Fort Calhoun, 2100ppm Boron, 4.20wt% U-235, 4 PRAs			
<i>Internal Moderator at 100% TD</i>	<i>0.9170</i>	<i>0.0009</i>	<i>0.9188</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9274</i>	<i>0.0009</i>	<i>0.9292</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9333</i>	<i>0.0009</i>	<i>0.9350</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9369</i>	<i>0.0009</i>	<i>0.9386</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9359</i>	<i>0.0009</i>	<i>0.9377</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9264</i>	<i>0.0010</i>	<i>0.9284</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9038</i>	<i>0.0008</i>	<i>0.9054</i>

Table M.6-19
CE 14x14 Class Assembly without BPRAs with Variable Soluble Boron Concentration Results
(20 Poison Plate Configuration)
(continued)

CE 14x14 Fort Calhoun, 2100ppm Boron, 4.7wt% U-235, 8 PRAs			
<i>Internal Moderator at 100% TD</i>	<i>0.9261</i>	<i>0.0009</i>	<i>0.9279</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9330</i>	<i>0.0009</i>	<i>0.9348</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9379</i>	<i>0.0009</i>	<i>0.9397</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9373</i>	<i>0.0011</i>	<i>0.9395</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9316</i>	<i>0.0009</i>	<i>0.9335</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9182</i>	<i>0.0008</i>	<i>0.9199</i>
<i>Internal Moderator at 40% TD</i>	<i>0.8939</i>	<i>0.0010</i>	<i>0.8959</i>
CE 14x14 Fort Calhoun, 2200ppm Boron, 3.75wt% U-235, no PRAs			
<i>Internal Moderator at 100% TD</i>	<i>0.8886</i>	<i>0.0009</i>	<i>0.8904</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9058</i>	<i>0.0009</i>	<i>0.9076</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9204</i>	<i>0.0010</i>	<i>0.9223</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9287</i>	<i>0.0009</i>	<i>0.9305</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9359</i>	<i>0.0011</i>	<i>0.9380</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9352</i>	<i>0.0010</i>	<i>0.9371</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9203</i>	<i>0.0009</i>	<i>0.9222</i>
CE 14x14 Fort Calhoun, 2200ppm Boron, 4.30wt% U-235, 4 PRAs			
<i>Internal Moderator at 100% TD</i>	<i>0.9152</i>	<i>0.0009</i>	<i>0.9170</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9252</i>	<i>0.0009</i>	<i>0.9270</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9335</i>	<i>0.0010</i>	<i>0.9354</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9384</i>	<i>0.0008</i>	<i>0.9401</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9366</i>	<i>0.0010</i>	<i>0.9385</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9284</i>	<i>0.0010</i>	<i>0.9304</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9060</i>	<i>0.0010</i>	<i>0.9080</i>
CE 14x14 Fort Calhoun, 2200ppm Boron, 4.8wt% U-235, 8 PRAs			
<i>Internal Moderator at 100% TD</i>	<i>0.9234</i>	<i>0.0009</i>	<i>0.9251</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9306</i>	<i>0.0009</i>	<i>0.9323</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9374</i>	<i>0.0009</i>	<i>0.9392</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9367</i>	<i>0.0009</i>	<i>0.9384</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9334</i>	<i>0.0009</i>	<i>0.9353</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9200</i>	<i>0.0009</i>	<i>0.9219</i>
<i>Internal Moderator at 40% TD</i>	<i>0.8975</i>	<i>0.0009</i>	<i>0.8994</i>

Table M.6-19
CE 14x14 Class Assembly without BPRAs with Variable Soluble Boron Concentration Results
(20 Poison Plate Configuration)
(continued)

CE 14x14 Fort Calhoun, 2300ppm Boron, 3.85wt% U-235, no PRAs			
<i>Internal Moderator at 100% TD</i>	0.8887	0.0010	0.8908
<i>Internal Moderator at 90% TD</i>	0.9038	0.0010	0.9058
<i>Internal Moderator at 80% TD</i>	0.9193	0.0009	0.9210
<i>Internal Moderator at 70% TD</i>	0.9300	0.0009	0.9319
<i>Internal Moderator at 60% TD</i>	0.9370	0.0010	0.9389
<i>Internal Moderator at 50% TD</i>	0.9360	0.0009	0.9378
<i>Internal Moderator at 40% TD</i>	0.9245	0.0009	0.9262
CE 14x14 Fort Calhoun, 2300ppm Boron, 4.40wt% U-235, 4 PRAs			
<i>Internal Moderator at 100% TD</i>	0.9141	0.0011	0.9164
<i>Internal Moderator at 90% TD</i>	0.9237	0.0010	0.9256
<i>Internal Moderator at 80% TD</i>	0.9322	0.0010	0.9342
<i>Internal Moderator at 70% TD</i>	0.9374	0.0011	0.9396
<i>Internal Moderator at 60% TD</i>	0.9372	0.0010	0.9391
<i>Internal Moderator at 50% TD</i>	0.9273	0.0009	0.9292
<i>Internal Moderator at 40% TD</i>	0.9087	0.0009	0.9105
CE 14x14 Fort Calhoun, 2300ppm Boron, 4.9wt% U-235, 8 PRAs			
<i>Internal Moderator at 100% TD</i>	0.9214	0.0009	0.9232
<i>Internal Moderator at 90% TD</i>	0.9286	0.0009	0.9304
<i>Internal Moderator at 80% TD</i>	0.9356	0.0009	0.9374
<i>Internal Moderator at 70% TD</i>	0.9360	0.0009	0.9378
<i>Internal Moderator at 60% TD</i>	0.9330	0.0009	0.9348
<i>Internal Moderator at 50% TD</i>	0.9199	0.0010	0.9218
<i>Internal Moderator at 40% TD</i>	0.8979	0.0010	0.8999
CE 14x14 Fort Calhoun, 2400ppm Boron, 3.9wt% U-235, no PRAs			
<i>Internal Moderator at 100% TD</i>	0.8824	0.0009	0.8842
<i>Internal Moderator at 90% TD</i>	0.8999	0.0009	0.9016
<i>Internal Moderator at 80% TD</i>	0.9142	0.0010	0.9161
<i>Internal Moderator at 70% TD</i>	0.9261	0.0010	0.9281
<i>Internal Moderator at 60% TD</i>	0.9340	0.0009	0.9358
<i>Internal Moderator at 50% TD</i>	0.9351	0.0009	0.9368
<i>Internal Moderator at 40% TD</i>	0.9225	0.0010	0.9246

Table M.6-19
CE 14x14 Class Assembly without BPRAs with *Variable Soluble Boron Concentration* Results
(20 Poison Plate Configuration)
(concluded)

CE 14x14 Fort Calhoun, 2400ppm Boron, 4.50wt% U-235, 4 PRAs			
<i>Internal Moderator at 100% TD</i>	0.9129	0.0010	0.9149
<i>Internal Moderator at 90% TD</i>	0.9206	0.0009	0.9224
<i>Internal Moderator at 80% TD</i>	0.9323	0.0009	0.9340
<i>Internal Moderator at 70% TD</i>	0.9381	0.0009	0.9399
<i>Internal Moderator at 60% TD</i>	0.9376	0.0009	0.9395
<i>Internal Moderator at 50% TD</i>	0.9302	0.0010	0.9323
<i>Internal Moderator at 40% TD</i>	0.9099	0.0010	0.9119
CE 14x14 Fort Calhoun, 2400ppm Boron, 5wt% U-235, 8 PRAs			
<i>Internal Moderator at 100% TD</i>	0.9195	0.0009	0.9212
<i>Internal Moderator at 90% TD</i>	0.9279	0.0011	0.9301
<i>Internal Moderator at 80% TD</i>	0.9328	0.0010	0.9347
<i>Internal Moderator at 70% TD</i>	0.9363	0.0009	0.9381
<i>Internal Moderator at 60% TD</i>	0.9326	0.0010	0.9347
<i>Internal Moderator at 50% TD</i>	0.9202	0.0010	0.9222
<i>Internal Moderator at 40% TD</i>	0.9005	0.0009	0.9023
CE 14x14 Fort Calhoun, 2500ppm Boron, 4.05wt% U-235, no PRAs			
<i>Internal Moderator at 100% TD</i>	0.8857	0.0009	0.8875
<i>Internal Moderator at 90% TD</i>	0.9032	0.0009	0.9049
<i>Internal Moderator at 80% TD</i>	0.9196	0.0010	0.9216
<i>Internal Moderator at 70% TD</i>	0.9314	0.0009	0.9332
<i>Internal Moderator at 60% TD</i>	0.9381	0.0013	0.9406
<i>Internal Moderator at 50% TD</i>	0.9386	0.0011	0.9408
<i>Internal Moderator at 40% TD</i>	0.9290	0.0009	0.9309
CE 14x14 Fort Calhoun, 2500ppm Boron, 4.55wt% U-235, 4 PRAs			
<i>Internal Moderator at 100% TD</i>	0.9076	0.0010	0.9095
<i>Internal Moderator at 90% TD</i>	0.9189	0.0009	0.9208
<i>Internal Moderator at 80% TD</i>	0.9274	0.0009	0.9292
<i>Internal Moderator at 70% TD</i>	0.9343	0.0010	0.9362
<i>Internal Moderator at 60% TD</i>	0.9348	0.0009	0.9366
<i>Internal Moderator at 50% TD</i>	0.9289	0.0010	0.9309
<i>Internal Moderator at 40% TD</i>	0.9123	0.0008	0.9140

Table M.6-20
WE 14x14 Class Assembly without BPRAs with Variable Soluble Boron Concentration
Results (20 Poison Plate Configuration)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
<i>WE 14x14 ZCA, 1800ppm Boron, 3.65wt% U-235, no PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.8997</i>	<i>0.0010</i>	<i>0.9017</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9121</i>	<i>0.0008</i>	<i>0.9138</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9239</i>	<i>0.0010</i>	<i>0.9259</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9317</i>	<i>0.0009</i>	<i>0.9336</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9371</i>	<i>0.0008</i>	<i>0.9388</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9344</i>	<i>0.0010</i>	<i>0.9364</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9209</i>	<i>0.0010</i>	<i>0.9228</i>
<i>WE 14x14 ZCA, 1800ppm Boron, 4.25wt% U-235, 4 PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9235</i>	<i>0.0010</i>	<i>0.9254</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9308</i>	<i>0.0009</i>	<i>0.9326</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9355</i>	<i>0.0010</i>	<i>0.9375</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9353</i>	<i>0.0011</i>	<i>0.9374</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9327</i>	<i>0.0009</i>	<i>0.9346</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9214</i>	<i>0.0009</i>	<i>0.9231</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9025</i>	<i>0.0009</i>	<i>0.9043</i>
<i>WE 14x14 ZCA, 2000ppm Boron, 3.85wt% U-235, no PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.8955</i>	<i>0.0009</i>	<i>0.8973</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9091</i>	<i>0.0010</i>	<i>0.9111</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9221</i>	<i>0.0010</i>	<i>0.9241</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9298</i>	<i>0.0009</i>	<i>0.9316</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9388</i>	<i>0.0011</i>	<i>0.9410</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9356</i>	<i>0.0009</i>	<i>0.9375</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9266</i>	<i>0.0010</i>	<i>0.9285</i>
<i>WE 14x14 ZCA, 2000ppm Boron, 4.5wt% U-235, 4 PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9211</i>	<i>0.0009</i>	<i>0.9229</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9281</i>	<i>0.0011</i>	<i>0.9304</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9343</i>	<i>0.0010</i>	<i>0.9363</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9361</i>	<i>0.0011</i>	<i>0.9382</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9373</i>	<i>0.0010</i>	<i>0.9393</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9286</i>	<i>0.0010</i>	<i>0.9306</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9104</i>	<i>0.0011</i>	<i>0.9126</i>

Table M.6-20
WE 14x14 Class Assembly without BPRAs with *Variable Soluble Boron Concentration Results*
(20 Poison Plate Configuration)
(continued)

WE 14x14 ZCA, 2100ppm Boron, 3.95wt% U-235, no PRAs			
<i>Internal Moderator at 100% TD</i>	<i>0.8946</i>	<i>0.0009</i>	<i>0.8964</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9079</i>	<i>0.0009</i>	<i>0.9097</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9202</i>	<i>0.0011</i>	<i>0.9223</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9328</i>	<i>0.0010</i>	<i>0.9348</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9380</i>	<i>0.0010</i>	<i>0.9400</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9369</i>	<i>0.0009</i>	<i>0.9387</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9290</i>	<i>0.0010</i>	<i>0.9310</i>
WE 14x14 ZCA, 2100ppm Boron, 4.6wt% U-235, 4 PRAs			
<i>Internal Moderator at 100% TD</i>	<i>0.9195</i>	<i>0.0010</i>	<i>0.9216</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9263</i>	<i>0.0010</i>	<i>0.9282</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9330</i>	<i>0.0011</i>	<i>0.9352</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9362</i>	<i>0.0009</i>	<i>0.9379</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9350</i>	<i>0.0009</i>	<i>0.9368</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9275</i>	<i>0.0009</i>	<i>0.9293</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9123</i>	<i>0.0010</i>	<i>0.9143</i>
WE 14x14 ZCA, 2200ppm Boron, 4wt% U-235, no PRAs			
<i>Internal Moderator at 100% TD</i>	<i>0.8896</i>	<i>0.0009</i>	<i>0.8914</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9028</i>	<i>0.0009</i>	<i>0.9046</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9168</i>	<i>0.0010</i>	<i>0.9189</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9275</i>	<i>0.0009</i>	<i>0.9294</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9352</i>	<i>0.0010</i>	<i>0.9371</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9380</i>	<i>0.0011</i>	<i>0.9401</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9265</i>	<i>0.0010</i>	<i>0.9285</i>
WE 14x14 ZCA, 2200ppm Boron, 4.7wt% U-235, 4 PRAs			
<i>Internal Moderator at 100% TD</i>	<i>0.9178</i>	<i>0.0010</i>	<i>0.9197</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9251</i>	<i>0.0010</i>	<i>0.9271</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9332</i>	<i>0.0010</i>	<i>0.9352</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9360</i>	<i>0.0011</i>	<i>0.9381</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9354</i>	<i>0.0011</i>	<i>0.9375</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9294</i>	<i>0.0010</i>	<i>0.9313</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9128</i>	<i>0.0011</i>	<i>0.9150</i>

Table M.6-20
WE 14x14 Class Assembly without BPRAs with Variable Soluble Boron Concentration Results
(20 Poison Plate Configuration)
(continued)

<i>WE 14x14 ZCA, 2300ppm Boron, 4.1wt% U-235, no PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.8874</i>	<i>0.0010</i>	<i>0.8893</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9010</i>	<i>0.0009</i>	<i>0.9028</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9163</i>	<i>0.0009</i>	<i>0.9182</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9281</i>	<i>0.0009</i>	<i>0.9300</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9327</i>	<i>0.0010</i>	<i>0.9347</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9372</i>	<i>0.0010</i>	<i>0.9393</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9307</i>	<i>0.0010</i>	<i>0.9328</i>
<i>WE 14x14 ZCA, 2300ppm Boron, 4.85wt% U-235, 4 PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9154</i>	<i>0.0008</i>	<i>0.9171</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9267</i>	<i>0.0010</i>	<i>0.9287</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9336</i>	<i>0.0010</i>	<i>0.9356</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9378</i>	<i>0.0009</i>	<i>0.9396</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9389</i>	<i>0.0010</i>	<i>0.9409</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9321</i>	<i>0.0009</i>	<i>0.9339</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9167</i>	<i>0.0010</i>	<i>0.9186</i>
<i>WE 14x14 ZCA, 2400ppm Boron, 4.2wt% U-235, no PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.8831</i>	<i>0.0009</i>	<i>0.8848</i>
<i>Internal Moderator at 90% TD</i>	<i>0.8994</i>	<i>0.0009</i>	<i>0.9011</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9144</i>	<i>0.0010</i>	<i>0.9164</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9273</i>	<i>0.0010</i>	<i>0.9293</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9349</i>	<i>0.0010</i>	<i>0.9369</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9379</i>	<i>0.0009</i>	<i>0.9397</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9332</i>	<i>0.0008</i>	<i>0.9349</i>
<i>WE 14x14 ZCA, 2400ppm Boron, 4.95wt% U-235, 4 PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9144</i>	<i>0.0010</i>	<i>0.9164</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9218</i>	<i>0.0011</i>	<i>0.9241</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9326</i>	<i>0.0011</i>	<i>0.9347</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9384</i>	<i>0.0010</i>	<i>0.9404</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9364</i>	<i>0.0010</i>	<i>0.9384</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9334</i>	<i>0.0010</i>	<i>0.9354</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9188</i>	<i>0.0009</i>	<i>0.9206</i>

Table M.6-20
WE 14x14 Class Assembly without BPRAs with Variable Soluble Boron Concentration Results
(20 Poison Plate Configuration)
(concluded)

<i>WE 14x14 ZCA, 2500ppm Boron, 4.25wt% U-235, no PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.8780</i>	<i>0.0009</i>	<i>0.8797</i>
<i>Internal Moderator at 90% TD</i>	<i>0.8942</i>	<i>0.0010</i>	<i>0.8962</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9114</i>	<i>0.0009</i>	<i>0.9131</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9214</i>	<i>0.0010</i>	<i>0.9234</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9318</i>	<i>0.0009</i>	<i>0.9336</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9383</i>	<i>0.0009</i>	<i>0.9401</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9293</i>	<i>0.0008</i>	<i>0.9309</i>
<i>WE 14x14 ZCA, 2500ppm Boron, 5wt% U-235, 4 PRAs</i>			
<i>Internal Moderator at 100% TD</i>	<i>0.9098</i>	<i>0.0009</i>	<i>0.9117</i>
<i>Internal Moderator at 90% TD</i>	<i>0.9189</i>	<i>0.0008</i>	<i>0.9206</i>
<i>Internal Moderator at 80% TD</i>	<i>0.9285</i>	<i>0.0009</i>	<i>0.9304</i>
<i>Internal Moderator at 70% TD</i>	<i>0.9348</i>	<i>0.0009</i>	<i>0.9365</i>
<i>Internal Moderator at 60% TD</i>	<i>0.9364</i>	<i>0.0010</i>	<i>0.9383</i>
<i>Internal Moderator at 50% TD</i>	<i>0.9325</i>	<i>0.0010</i>	<i>0.9345</i>
<i>Internal Moderator at 40% TD</i>	<i>0.9185</i>	<i>0.0010</i>	<i>0.9204</i>

**Table M.6-21
Criticality Results**

STORAGE

Model Description	k_{KENO}	1σ	k_{eff}
Regulatory Requirements			
Dry Storage (Bounded by infinite array of dry casks)	0.5821	0.0005	0.5831
Normal Conditions (Wet Loading)	0.9292	0.0010	0.9312
Accident Conditions (Damaged TC while fuel still wet)	0.9388	0.0011	0.9410

Table M.6-25
Enrichment Data for Loading Pattern 1

Radial Zone	Enrichment (wt% U-235)
Average	3.47
Radial Zone 1	3.95
Radial Zone 2	3.15
Radial Zone 3	2.73
Radial Zone 4	2.45

Enrichment Data for Loading Pattern 2

Radial Zone	Enrichment (wt% U-235) for Various Zones		
	Pattern 2A	Pattern 2B	Pattern 2C
Average	4.07	4.24	4.39
Radial Zone 1	4.42	4.56	4.78
Radial Zone 2	3.70	3.85	4.00
Radial Zone 3	2.90	3.02	3.13
Radial Zone 4	2.20	2.28	2.37

Table M.6-26
Results for the Exxon/ANF 15x15 Fuel Assembly

Model Description	k_{KENO}	1σ	k_{eff}
Exxon/ANF 15x15 CE, Uniform Maximum Lattice Average Enrichment, Loading Pattern 1			
MD=40%	0.8856	0.0009	0.8874
MD=50%	0.9074	0.0009	0.9092
MD=55%	0.9111	0.0009	0.9129
MD=60%	0.9146	0.0008	0.9162
MD=65%	0.9176	0.0007	0.9190
MD=70%	0.9169	0.0009	0.9187
MD=75%	0.9160	0.0007	0.9174
MD=80%	0.9159	0.0009	0.9177
MD=85%	0.9115	0.0008	0.9131
MD=90%	0.9081	0.0009	0.9099
MD=95%	0.9036	0.0007	0.9050
MD=100%	0.8994	0.0010	0.9014
Exxon/ANF 15x15 CE, Non-Uniform Radial Enrichment, Loading Pattern 1			
MD=40%	0.8812	0.0008	0.8828
MD=50%	0.9008	0.0008	0.9024
MD=55%	0.9052	0.0009	0.9070
MD=60%	0.9106	0.0009	0.9124
MD=65%	0.9115	0.0008	0.9131
MD=70%	0.9120	0.0009	0.9138
MD=75%	0.9109	0.0009	0.9127
MD=80%	0.9108	0.0009	0.9126
MD=85%	0.9073	0.0008	0.9089
MD=90%	0.9037	0.0009	0.9055
MD=95%	0.9000	0.0010	0.9020
MD=100%	0.8959	0.0008	0.8975
Exxon/ANF 15x15 CE, Results for the Uniform Maximum Lattice Average Enrichment Cases			
Loading Pattern 2A			
MD=60%	0.9611	0.0009	0.9629
MD=70%	0.9649	0.0008	0.9665
MD=80%	0.9628	0.0010	0.9648
MD=100%	0.9481	0.0009	0.9499
Loading Pattern 2B			
MD=60%	0.9723	0.0009	0.9741
MD=70%	0.9780	0.0009	0.9798
MD=80%	0.9742	0.0010	0.9762
MD=100%	0.9618	0.0009	0.9636

Table M.6-26
Results for the Exxon/ANF 15x15 Fuel Assembly
(Concluded)

Model Description	k_{KENO}	1σ	k_{eff}
Loading Pattern 2C			
MD=60%	0.9809	0.0008	0.9825
MD=70%	0.9866	0.0009	0.9884
MD=80%	0.9839	0.0009	0.9857
MD=100%	0.9736	0.0008	0.9752
Exxon/ANF 15x15 CE, Results for the Non-Uniform Radial Enrichment Cases			
Loading Pattern 2A			
MD=60%	0.9531	0.0008	0.9547
MD=70%	0.9602	0.0008	0.9618
MD=80%	0.9569	0.0010	0.9589
MD=100%	0.9436	0.0008	0.9452
Loading Pattern 2B			
MD=60%	0.9637	0.0009	0.9655
MD=70%	0.9683	0.0010	0.9703
MD=80%	0.9661	0.0009	0.9679
MD=100%	0.9549	0.0009	0.9567
Loading Pattern 2C			
MD=60%	0.9757	0.0010	0.9777
MD=70%	0.9801	0.0009	0.9819
MD=80%	0.9797	0.0008	0.9813
MD=100%	0.9665	0.0009	0.9683

Table M.6-27
Results for the WE 17x17 Class Fuel Assembly without BPRAs (16 Poison Plates
Configuration, 2500 ppm Soluble Boron Concentration)

Model Description	k_{KENO}	1σ	k_{eff}
Initial Enrichment 3.4 w/o U-235, No BPRAs			
MD=40%	0.9094	0.0009	0.9112
MD=50%	0.9267	0.0008	0.9283
MD=55%	0.9311	0.0009	0.9329
MD=60%	0.9320	0.0009	0.9338
MD=65%	0.9332	0.0008	0.9348
MD=70%	0.9324	0.0008	0.9340
MD=75%	0.9303	0.0009	0.9321
MD=80%	0.9256	0.0008	0.9272
MD=85%	0.9204	0.0008	0.9220
MD=90%	0.9150	0.0009	0.9168
MD=95%	0.9099	0.0010	0.9119
MD=100%	0.9038	0.0009	0.9056

Table M.6-28
**Results for the WE 17x17 Class Fuel Assembly with BPRAs (16 Poison Plate *Configuration*,
 2500 ppm Soluble Boron Concentration)**

Model Description	k _{KENO}	1 σ	k _{eff}
Initial Enrichment 3.4 w/o U-235, With BPRAs			
MD=40%	0.9018	0.0009	0.9036
MD=50%	0.9208	0.0009	0.9226
MD=55%	0.9265	0.0008	0.9281
MD=60%	0.9327	0.0009	0.9345
MD=65%	0.9354	0.0009	0.9372
MD=70%	0.9340	0.0009	0.9358
MD=75%	0.9351	0.0009	0.9369
MD=80%	0.9321	0.0008	0.9337
MD=85%	0.9303	0.0008	0.9319
MD=90%	0.9284	0.0008	0.9300
MD=95%	0.9231	0.0008	0.9247
MD=100%	0.9179	0.0008	0.9195

Table M.6-29
Results for the WE 17x17 Class Fuel Assembly without BPRAs (24 Poison Plates
Configuration, 2500 ppm Soluble Boron Concentration)

Model Description	k _{KENO}	1 σ	k _{eff}
Initial Enrichment 3.4 w/o U-235, No BPRAs, No PRAs			
MD=40%	0.8829	0.0009	0.8847
MD=50%	0.9030	0.0009	0.9048
MD=60%	0.9136	0.0009	0.9154
MD=70%	0.9134	0.0009	0.9152
MD=80%	0.9083	0.0009	0.9101
MD=90%	0.9008	0.0010	0.9028
MD=100%	0.8900	0.0008	0.8916
Initial Enrichment 4.0 w/o U-235, No BPRAs, 4 PRAs			
MD=40%	0.8728	0.0009	0.8746
MD=50%	0.9005	0.0010	0.9025
MD=60%	0.9176	0.0009	0.9194
MD=70%	0.9237	0.0010	0.9257
MD=80%	0.9242	0.0009	0.9260
MD=90%	0.9221	0.0009	0.9239
MD=100%	0.9153	0.0009	0.9171
Initial Enrichment 4.5 w/o U-235, No BPRAs, 8 PRAs			
MD=40%	0.8604	0.0008	0.8620
MD=50%	0.8931	0.0009	0.8949
MD=60%	0.9126	0.0010	0.9146
MD=70%	0.9240	0.0010	0.9260
MD=80%	0.9283	0.0009	0.9301
MD=90%	0.9298	0.0009	0.9316
MD=100%	0.9265	0.0010	0.9285
Initial Enrichment 5.0 w/o U-235, No BPRAs, 16 PRAs			
MD=40%	0.8023	0.0010	0.8043
MD=50%	0.8401	0.0009	0.8419
MD=60%	0.8645	0.0011	0.8667
MD=70%	0.8841	0.0011	0.8863
MD=80%	0.8974	0.0012	0.8998
MD=90%	0.9049	0.0012	0.9073
MD=100%	0.9071	0.0012	0.9095

Table M.6-30
Results for the WE 17x17 Class Fuel Assembly with BPRAs (24 Poison Plates
Configuration, 2500 ppm Soluble Boron Concentration)

Model Description	k_{KENO}	1σ	k_{eff}
Initial Enrichment 3.4 w/o U-235, with BPRAs, No PRAs			
MD=40%	0.8739	0.0009	0.8757
MD=50%	0.8960	0.0010	0.8980
MD=60%	0.9093	0.0008	0.9109
MD=70%	0.9144	0.0008	0.9160
MD=80%	0.9143	0.0009	0.9161
MD=90%	0.9117	0.0008	0.9133
MD=100%	0.9049	0.0010	0.9069
Initial Enrichment 4.0 w/o U-235, with BPRAs, 4 PRAs			
MD=40%	0.8627	0.0009	0.8645
MD=50%	0.8932	0.0008	0.8948
MD=60%	0.9115	0.0008	0.9131
MD=70%	0.9237	0.0009	0.9255
MD=80%	0.9293	0.0008	0.9309
MD=90%	0.9297	0.0010	0.9317
MD=100%	0.9256	0.0008	0.9272
Initial Enrichment 4.5 w/o U-235, with BPRAs, 8 PRAs			
MD=40%	0.8481	0.0009	0.8499
MD=50%	0.8840	0.0011	0.8862
MD=60%	0.9051	0.0011	0.9073
MD=70%	0.9205	0.0009	0.9223
MD=80%	0.9293	0.0009	0.9311
MD=90%	0.9345	0.0010	0.9365
MD=100%	0.9352	0.0011	0.9374
Initial Enrichment 5.0 w/o U-235, with BPRAs, 16 PRAs			
MD=40%	0.7905	0.0010	0.7925
MD=50%	0.8276	0.0009	0.8294
MD=60%	0.8567	0.0010	0.8587
MD=70%	0.8798	0.0011	0.8820
MD=80%	0.8937	0.0011	0.8959
MD=90%	0.9035	0.0012	0.9059
MD=100%	0.9119	0.0011	0.9141

Table M.6-31
Results for the B&W 15x15 Class Fuel Assembly without BPRAs (16 Poison Plates
Configuration, 2500 ppm Soluble Boron Concentration

Model Description	k _{KENO}	1 σ	k _{eff}
Initial Enrichment 3.3 w/o U-235, No BPRAs			
MD=40%	0.9077	0.0010	0.9097
MD=50%	0.9236	0.0009	0.9254
MD=55%	0.9287	0.0008	0.9303
MD=60%	0.9291	0.0008	0.9307
MD=65%	0.9301	0.0008	0.9317
MD=70%	0.9275	0.0009	0.9293
MD=75%	0.9246	0.0008	0.9262
MD=80%	0.9215	0.0008	0.9231
MD=85%	0.9168	0.0008	0.9184
MD=90%	0.9106	0.0009	0.9124
MD=95%	0.9025	0.0009	0.9043
MD=100%	0.8975	0.0007	0.8989

Table M.6-32
Results for the B&W 15x15 Class Fuel Assembly with BPRAs (16 Poison Plates
Configuration, 2500 ppm Soluble Boron Concentration)

Model Description	k_{KENO}	1σ	k_{eff}
Initial Enrichment 3.3 w/o U-235, With BPRAs			
MD=40%	0.9003	0.0009	0.9021
MD=50%	0.9211	0.0009	0.9229
MD=55%	0.9267	0.0009	0.9285
MD=60%	0.9293	0.0008	0.9309
MD=65%	0.9321	0.0009	0.9339
MD=70%	0.9323	0.0009	0.9341
MD=75%	0.9324	0.0007	0.9338
MD=80%	0.9284	0.0010	0.9304
MD=85%	0.9260	0.0008	0.9276
MD=90%	0.9214	0.0009	0.9232
MD=95%	0.9177	0.0008	0.9193
MD=100%	0.9137	0.0008	0.9153

Table M.6-33
Results for the B&W 15x15 Class Fuel Assembly without BPRAs (24 Poison Plates
Configuration, 2500 ppm Soluble Boron Concentration)

Model Description	k _{KENO}	1 σ	k _{eff}
Initial Enrichment 3.3 w/o U-235, No BPRAs, No PRAs			
MD=40%	0.8785	0.0009	0.8803
MD=50%	0.8999	0.0008	0.9015
MD=60%	0.9078	0.0009	0.9096
MD=70%	0.9077	0.0008	0.9093
MD=80%	0.9034	0.0008	0.9050
MD=90%	0.8953	0.0009	0.8971
MD=100%	0.8829	0.0010	0.8849
Initial Enrichment 3.9 w/o U-235, No BPRAs, 4 PRAs			
MD=40%	0.8794	0.0010	0.8814
MD=50%	0.9058	0.0009	0.9076
MD=60%	0.9204	0.0009	0.9222
MD=70%	0.9254	0.0009	0.9272
MD=80%	0.9275	0.0009	0.9293
MD=90%	0.9236	0.0009	0.9254
MD=100%	0.9130	0.0008	0.9146
Initial Enrichment 5.0 w/o U-235, No BPRAs, 16 PRAs			
MD=40%	0.8357	0.0008	0.8373
MD=50%	0.8704	0.0010	0.8724
MD=60%	0.8929	0.0009	0.8947
MD=70%	0.9100	0.0010	0.9120
MD=80%	0.9194	0.0011	0.9216
MD=90%	0.9233	0.0011	0.9255
MD=100%	0.9234	0.0012	0.9258

Table M.6-34
Results for the B&W 15x15 Class Fuel Assembly with BPRAs (24 Poison Plates
Configuration, 2500 ppm Soluble Boron Concentration)

Model Description	k_{KENO}	1σ	k_{eff}
Initial Enrichment 3.3 w/o U-235, with BPRAs, No PRAs			
MD=40%	0.8704	0.0009	0.8722
MD=50%	0.8953	0.0009	0.8971
MD=60%	0.9060	0.0009	0.9078
MD=70%	0.9117	0.0011	0.9139
MD=80%	0.9111	0.0008	0.9127
MD=90%	0.9050	0.0008	0.9066
MD=100%	0.8982	0.0008	0.8998
Initial Enrichment 3.9 w/o U-235, with BPRAs, 4 PRAs			
MD=40%	0.8711	0.0009	0.8729
MD=50%	0.8995	0.0009	0.9013
MD=60%	0.9167	0.0009	0.9185
MD=70%	0.9288	0.0009	0.9306
MD=80%	0.9299	0.0008	0.9315
MD=90%	0.9303	0.0010	0.9323
MD=100%	0.9257	0.0010	0.9277
Initial Enrichment 5.0 w/o U-235, with BPRAs, 16 PRAs			
MD=40%	0.8278	0.0009	0.8296
MD=50%	0.8606	0.0010	0.8626
MD=60%	0.8891	0.0008	0.8907
MD=70%	0.9062	0.0011	0.9084
MD=80%	0.9196	0.0012	0.9220
MD=90%	0.9269	0.0011	0.9291
MD=100%	0.9304	0.0010	0.9324

Table M.6-35
Results for the CE 15x15 Class Fuel Assembly without BPRAs
(16 Poison Plates *Configuration*)

Superseded by Table M.6-41

Table M.6-36
Results for the WE 15x15 Class Fuel Assembly without BPRAs (16 Poison Plates
Configuration, 2500 ppm Soluble Boron Concentration

Model Description	k _{KENO}	1 σ	k _{eff}
Initial Enrichment 3.4 w/o U-235, No BPRAs			
MD=40%	0.9129	0.0009	0.9147
MD=50%	0.9280	0.0010	0.9300
MD=55%	0.9320	0.0010	0.9340
MD=60%	0.9316	0.0008	0.9332
MD=65%	0.9321	0.0010	0.9341
MD=70%	0.9287	0.0008	0.9303
MD=75%	0.9257	0.0009	0.9275
MD=80%	0.9198	0.0008	0.9214
MD=85%	0.9158	0.0008	0.9174
MD=90%	0.9074	0.0008	0.9090
MD=95%	0.9008	0.0009	0.9026
MD=100%	0.8948	0.0009	0.8966

Table M.6-37
Results for the WE 15x15 Class Fuel Assembly without BPRAs (24 Poison Plates
Configuration, 2500 ppm Soluble Boron Concentration)

Model Description	k_{KENO}	1σ	k_{eff}
Initial Enrichment 3.4 w/o U-235, No BPRAs, No PRAs			
MD=40%	0.8847	0.0008	0.8863
MD=50%	0.9035	0.0009	0.9053
MD=60%	0.9106	0.0008	0.9122
MD=70%	0.9096	0.0008	0.9112
MD=80%	0.9040	0.0009	0.9058
MD=90%	0.8949	0.0008	0.8965
MD=100%	0.8805	0.0008	0.8821
Initial Enrichment 4.0 w/o U-235, No BPRAs, 4 PRAs			
MD=40%	0.8803	0.0009	0.8821
MD=50%	0.9049	0.0008	0.9065
MD=60%	0.9194	0.0008	0.9210
MD=70%	0.9234	0.0008	0.9250
MD=80%	0.9224	0.0010	0.9244
MD=90%	0.9174	0.0010	0.9194
MD=100%	0.9092	0.0009	0.9110
Initial Enrichment 4.6 w/o U-235, No BPRAs, 8 PRAs			
MD=40%	0.8756	0.0008	0.8772
MD=50%	0.9022	0.0010	0.9042
MD=60%	0.9234	0.0009	0.9252
MD=70%	0.9321	0.0009	0.9339
MD=80%	0.9352	0.0010	0.9372
MD=90%	0.9327	0.0009	0.9345
MD=100%	0.9270	0.0011	0.9292
Initial Enrichment 5.0 w/o U-235, No BPRAs, 16 PRAs			
MD=40%	0.8161	0.0008	0.8177
MD=50%	0.8525	0.0010	0.8545
MD=60%	0.8754	0.0010	0.8774
MD=70%	0.8927	0.0010	0.8947
MD=80%	0.9008	0.0010	0.9028
MD=90%	0.9056	0.0012	0.9080
MD=100%	0.9046	0.0012	0.9070

Table M.6-38
Results for the CE 14x14 Class Fuel Assembly without BPRAs (16 Poison Plate
***Configuration*)**

Superseded by Table M.6-42

Table M.6-39
Results for the CE 14x14 Class Fuel Assembly without BPRAs (24 Poison Plate
Configuration)

Superseded by Table M.6-42

Table M.6-40
Results for the WE 14x14 Class Fuel Assembly without BPRAs (16 Poison Plate
***Configuration*)**

Superseded by Table M.6-43

Table M.6-41
CE 15x15 Class Assembly Variable Soluble Boron Concentration Final Results (16 or 24
Poison Plate Configurations)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
CE 15x15 Palisades, 1800 ppm boron, 16 Poison plates, 3.00 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.8889</i>	<i>0.0009</i>	<i>0.8907</i>
<i>MD = 50%</i>	<i>0.9152</i>	<i>0.0009</i>	<i>0.9170</i>
<i>MD = 60%</i>	<i>0.9273</i>	<i>0.0009</i>	<i>0.9291</i>
<i>MD = 65%</i>	<i>0.9320</i>	<i>0.0008</i>	<i>0.9336</i>
<i>MD = 70%</i>	<i>0.9329</i>	<i>0.0008</i>	<i>0.9345</i>
<i>MD = 75%</i>	<i>0.9356</i>	<i>0.0009</i>	<i>0.9374</i>
<i>MD = 80%</i>	<i>0.9330</i>	<i>0.0009</i>	<i>0.9348</i>
<i>MD = 90%</i>	<i>0.9291</i>	<i>0.0009</i>	<i>0.9309</i>
<i>MD = 100%</i>	<i>0.9240</i>	<i>0.0009</i>	<i>0.9258</i>
CE 15x15 Palisades, 1800 ppm boron, 24 Poison plates, 3.15 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.8794</i>	<i>0.0010</i>	<i>0.8814</i>
<i>MD = 50%</i>	<i>0.9049</i>	<i>0.0010</i>	<i>0.9069</i>
<i>MD = 60%</i>	<i>0.9198</i>	<i>0.0011</i>	<i>0.9220</i>
<i>MD = 65%</i>	<i>0.9248</i>	<i>0.0010</i>	<i>0.9268</i>
<i>MD = 70%</i>	<i>0.9295</i>	<i>0.0010</i>	<i>0.9315</i>
<i>MD = 75%</i>	<i>0.9320</i>	<i>0.0009</i>	<i>0.9338</i>
<i>MD = 80%</i>	<i>0.9326</i>	<i>0.0009</i>	<i>0.9344</i>
<i>MD = 90%</i>	<i>0.9314</i>	<i>0.0009</i>	<i>0.9332</i>
<i>MD = 100%</i>	<i>0.9266</i>	<i>0.0010</i>	<i>0.9286</i>
CE 15x15 Palisades, 2000 ppm boron, 16 Poison plates, 3.15 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.8945</i>	<i>0.0010</i>	<i>0.8965</i>
<i>MD = 50%</i>	<i>0.9198</i>	<i>0.0010</i>	<i>0.9218</i>
<i>MD = 60%</i>	<i>0.9298</i>	<i>0.0009</i>	<i>0.9316</i>
<i>MD = 65%</i>	<i>0.9336</i>	<i>0.0011</i>	<i>0.9358</i>
<i>MD = 70%</i>	<i>0.9338</i>	<i>0.0008</i>	<i>0.9354</i>
<i>MD = 75%</i>	<i>0.9338</i>	<i>0.0009</i>	<i>0.9356</i>
<i>MD = 80%</i>	<i>0.9327</i>	<i>0.0009</i>	<i>0.9345</i>
<i>MD = 90%</i>	<i>0.9284</i>	<i>0.0008</i>	<i>0.9300</i>
<i>MD = 100%</i>	<i>0.9200</i>	<i>0.0008</i>	<i>0.9216</i>

Table M.6-41
CE 15x15 Class Assembly Variable Soluble Boron Concentration Final Results (16 or 24
Poison Plate Configurations)
(continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
CE 15x15 Palisades, 2000 ppm boron, 24 Poison plates, 3.30 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.8850</i>	<i>0.0011</i>	<i>0.8872</i>
<i>MD = 50%</i>	<i>0.9085</i>	<i>0.0009</i>	<i>0.9103</i>
<i>MD = 60%</i>	<i>0.9232</i>	<i>0.0011</i>	<i>0.9254</i>
<i>MD = 65%</i>	<i>0.9274</i>	<i>0.0010</i>	<i>0.9294</i>
<i>MD = 70%</i>	<i>0.9304</i>	<i>0.0009</i>	<i>0.9322</i>
<i>MD = 75%</i>	<i>0.9312</i>	<i>0.0009</i>	<i>0.9330</i>
<i>MD = 80%</i>	<i>0.9331</i>	<i>0.0009</i>	<i>0.9349</i>
<i>MD = 90%</i>	<i>0.9284</i>	<i>0.0009</i>	<i>0.9302</i>
<i>MD = 100%</i>	<i>0.9231</i>	<i>0.0008</i>	<i>0.9247</i>
CE 15x15 Palisades, 2100 ppm boron, 16 Poison plates, 3.20 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.8954</i>	<i>0.0008</i>	<i>0.8970</i>
<i>MD = 50%</i>	<i>0.9170</i>	<i>0.0010</i>	<i>0.9190</i>
<i>MD = 60%</i>	<i>0.9282</i>	<i>0.0011</i>	<i>0.9304</i>
<i>MD = 65%</i>	<i>0.9308</i>	<i>0.0008</i>	<i>0.9324</i>
<i>MD = 70%</i>	<i>0.9316</i>	<i>0.0009</i>	<i>0.9334</i>
<i>MD = 75%</i>	<i>0.9309</i>	<i>0.0009</i>	<i>0.9327</i>
<i>MD = 80%</i>	<i>0.9294</i>	<i>0.0008</i>	<i>0.9310</i>
<i>MD = 90%</i>	<i>0.9233</i>	<i>0.0009</i>	<i>0.9251</i>
<i>MD = 100%</i>	<i>0.9154</i>	<i>0.0008</i>	<i>0.9170</i>
CE 15x15 Palisades, 2100 ppm boron, 24 Poison plates, 3.40 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.8889</i>	<i>0.0008</i>	<i>0.8905</i>
<i>MD = 50%</i>	<i>0.9113</i>	<i>0.0009</i>	<i>0.9131</i>
<i>MD = 60%</i>	<i>0.9276</i>	<i>0.0009</i>	<i>0.9294</i>
<i>MD = 65%</i>	<i>0.9306</i>	<i>0.0010</i>	<i>0.9326</i>
<i>MD = 70%</i>	<i>0.9318</i>	<i>0.0009</i>	<i>0.9336</i>
<i>MD = 75%</i>	<i>0.9326</i>	<i>0.0009</i>	<i>0.9344</i>
<i>MD = 80%</i>	<i>0.9311</i>	<i>0.0010</i>	<i>0.9331</i>
<i>MD = 90%</i>	<i>0.9299</i>	<i>0.0009</i>	<i>0.9317</i>
<i>MD = 100%</i>	<i>0.9242</i>	<i>0.0010</i>	<i>0.9262</i>

Table M.6-41
CE 15x15 Class Assembly Variable Soluble Boron Concentration Final Results (16 or 24
Poison Plate Configurations)
(continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
CE 15x15 Palisades, 2200 ppm boron, 16 Poison plates, 3.30 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9007</i>	<i>0.0009</i>	<i>0.9025</i>
<i>MD = 50%</i>	<i>0.9215</i>	<i>0.0008</i>	<i>0.9231</i>
<i>MD = 60%</i>	<i>0.9327</i>	<i>0.0008</i>	<i>0.9343</i>
<i>MD = 65%</i>	<i>0.9319</i>	<i>0.0009</i>	<i>0.9337</i>
<i>MD = 70%</i>	<i>0.9341</i>	<i>0.0009</i>	<i>0.9359</i>
<i>MD = 75%</i>	<i>0.9340</i>	<i>0.0009</i>	<i>0.9358</i>
<i>MD = 80%</i>	<i>0.9313</i>	<i>0.0008</i>	<i>0.9329</i>
<i>MD = 90%</i>	<i>0.9255</i>	<i>0.0007</i>	<i>0.9269</i>
<i>MD = 100%</i>	<i>0.9170</i>	<i>0.0008</i>	<i>0.9186</i>
CE 15x15 Palisades, 2200 ppm boron, 24 Poison plates, 3.50 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.8932</i>	<i>0.0011</i>	<i>0.8954</i>
<i>MD = 50%</i>	<i>0.9163</i>	<i>0.0008</i>	<i>0.9179</i>
<i>MD = 60%</i>	<i>0.9283</i>	<i>0.0009</i>	<i>0.9301</i>
<i>MD = 65%</i>	<i>0.9327</i>	<i>0.0010</i>	<i>0.9347</i>
<i>MD = 70%</i>	<i>0.9319</i>	<i>0.0010</i>	<i>0.9339</i>
<i>MD = 75%</i>	<i>0.9351</i>	<i>0.0009</i>	<i>0.9369</i>
<i>MD = 80%</i>	<i>0.9343</i>	<i>0.0010</i>	<i>0.9363</i>
<i>MD = 90%</i>	<i>0.9300</i>	<i>0.0010</i>	<i>0.9320</i>
<i>MD = 100%</i>	<i>0.9238</i>	<i>0.0009</i>	<i>0.9256</i>
CE 15x15 Palisades, 2300 ppm boron, 16 Poison plates, 3.35 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.8998</i>	<i>0.0009</i>	<i>0.9016</i>
<i>MD = 50%</i>	<i>0.9194</i>	<i>0.0008</i>	<i>0.9210</i>
<i>MD = 60%</i>	<i>0.9291</i>	<i>0.0010</i>	<i>0.9311</i>
<i>MD = 65%</i>	<i>0.9315</i>	<i>0.0008</i>	<i>0.9331</i>
<i>MD = 70%</i>	<i>0.9321</i>	<i>0.0008</i>	<i>0.9337</i>
<i>MD = 75%</i>	<i>0.9317</i>	<i>0.0008</i>	<i>0.9333</i>
<i>MD = 80%</i>	<i>0.9294</i>	<i>0.0008</i>	<i>0.9310</i>
<i>MD = 90%</i>	<i>0.9220</i>	<i>0.0009</i>	<i>0.9238</i>
<i>MD = 100%</i>	<i>0.9116</i>	<i>0.0008</i>	<i>0.9132</i>

Table M.6-41
CE 15x15 Class Assembly Variable Soluble Boron Concentration Final Results (16 or 24
Poison Plate Configurations)
(continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
CE 15x15 Palisades, 2300 ppm boron, 24 Poison plates, 3.55 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.8927</i>	<i>0.0009</i>	<i>0.8945</i>
<i>MD = 50%</i>	<i>0.9161</i>	<i>0.0008</i>	<i>0.9177</i>
<i>MD = 60%</i>	<i>0.9285</i>	<i>0.0008</i>	<i>0.9301</i>
<i>MD = 65%</i>	<i>0.9300</i>	<i>0.0009</i>	<i>0.9318</i>
<i>MD = 70%</i>	<i>0.9343</i>	<i>0.0009</i>	<i>0.9361</i>
<i>MD = 75%</i>	<i>0.9326</i>	<i>0.0010</i>	<i>0.9346</i>
<i>MD = 80%</i>	<i>0.9333</i>	<i>0.0009</i>	<i>0.9351</i>
<i>MD = 90%</i>	<i>0.9281</i>	<i>0.0008</i>	<i>0.9297</i>
<i>MD = 100%</i>	<i>0.9217</i>	<i>0.0009</i>	<i>0.9235</i>
CE 15x15 Palisades, 2400 ppm boron, 16 Poison plates, 3.40 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9008</i>	<i>0.0008</i>	<i>0.9024</i>
<i>MD = 50%</i>	<i>0.9207</i>	<i>0.0008</i>	<i>0.9223</i>
<i>MD = 60%</i>	<i>0.9300</i>	<i>0.0010</i>	<i>0.9320</i>
<i>MD = 65%</i>	<i>0.9300</i>	<i>0.0009</i>	<i>0.9318</i>
<i>MD = 70%</i>	<i>0.9305</i>	<i>0.0008</i>	<i>0.9321</i>
<i>MD = 75%</i>	<i>0.9300</i>	<i>0.0009</i>	<i>0.9318</i>
<i>MD = 80%</i>	<i>0.9253</i>	<i>0.0008</i>	<i>0.9269</i>
<i>MD = 90%</i>	<i>0.9188</i>	<i>0.0008</i>	<i>0.9204</i>
<i>MD = 100%</i>	<i>0.9084</i>	<i>0.0008</i>	<i>0.9100</i>
CE 15x15 Palisades, 2400 ppm boron, 24 Poison plates, 3.60 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.8928</i>	<i>0.0008</i>	<i>0.8944</i>
<i>MD = 50%</i>	<i>0.9146</i>	<i>0.0010</i>	<i>0.9166</i>
<i>MD = 60%</i>	<i>0.9260</i>	<i>0.0010</i>	<i>0.9280</i>
<i>MD = 65%</i>	<i>0.9297</i>	<i>0.0009</i>	<i>0.9315</i>
<i>MD = 70%</i>	<i>0.9301</i>	<i>0.0009</i>	<i>0.9319</i>
<i>MD = 75%</i>	<i>0.9301</i>	<i>0.0010</i>	<i>0.9321</i>
<i>MD = 80%</i>	<i>0.9304</i>	<i>0.0008</i>	<i>0.9320</i>
<i>MD = 90%</i>	<i>0.9255</i>	<i>0.0008</i>	<i>0.9271</i>
<i>MD = 100%</i>	<i>0.9185</i>	<i>0.0009</i>	<i>0.9203</i>

Table M.6-41
CE 15x15 Class Assembly Variable Soluble Boron Concentration Final Results (16 or 24
Poison Plate Configurations)
(concluded)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
CE 15x15 Palisades, 2500 ppm boron, 16 Poison plates, 3.50 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9046</i>	<i>0.0009</i>	<i>0.9064</i>
<i>MD = 50%</i>	<i>0.9234</i>	<i>0.0009</i>	<i>0.9252</i>
<i>MD = 60%</i>	<i>0.9323</i>	<i>0.0009</i>	<i>0.9341</i>
<i>MD = 65%</i>	<i>0.9331</i>	<i>0.0009</i>	<i>0.9349</i>
<i>MD = 70%</i>	<i>0.9323</i>	<i>0.0009</i>	<i>0.9341</i>
<i>MD = 75%</i>	<i>0.9295</i>	<i>0.0008</i>	<i>0.9311</i>
<i>MD = 80%</i>	<i>0.9286</i>	<i>0.0009</i>	<i>0.9304</i>
<i>MD = 90%</i>	<i>0.9191</i>	<i>0.0009</i>	<i>0.9209</i>
<i>MD = 100%</i>	<i>0.9081</i>	<i>0.0009</i>	<i>0.9099</i>
CE 15x15 Palisades, 2500 ppm boron, 24 Poison plates, 3.70 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.8980</i>	<i>0.0010</i>	<i>0.9000</i>
<i>MD = 50%</i>	<i>0.9202</i>	<i>0.0008</i>	<i>0.9218</i>
<i>MD = 60%</i>	<i>0.9300</i>	<i>0.0010</i>	<i>0.9320</i>
<i>MD = 65%</i>	<i>0.9328</i>	<i>0.0011</i>	<i>0.9350</i>
<i>MD = 70%</i>	<i>0.9336</i>	<i>0.0010</i>	<i>0.9356</i>
<i>MD = 75%</i>	<i>0.9337</i>	<i>0.0009</i>	<i>0.9355</i>
<i>MD = 80%</i>	<i>0.9314</i>	<i>0.0008</i>	<i>0.9330</i>
<i>MD = 90%</i>	<i>0.9239</i>	<i>0.0011</i>	<i>0.9261</i>
<i>MD = 100%</i>	<i>0.9161</i>	<i>0.0009</i>	<i>0.9179</i>

Table M.6-42
CE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
CE 14x14 Fort Calhoun, 1800 ppm boron, 16 Poison plates, 3.35 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9051</i>	<i>0.0008</i>	<i>0.9067</i>
<i>MD = 50%</i>	<i>0.9254</i>	<i>0.0009</i>	<i>0.9272</i>
<i>MD = 55%</i>	<i>0.9313</i>	<i>0.0008</i>	<i>0.9329</i>
<i>MD = 60%</i>	<i>0.9349</i>	<i>0.0009</i>	<i>0.9367</i>
<i>MD = 65%</i>	<i>0.9343</i>	<i>0.0011</i>	<i>0.9365</i>
<i>MD = 70%</i>	<i>0.9352</i>	<i>0.0009</i>	<i>0.9370</i>
<i>MD = 75%</i>	<i>0.9329</i>	<i>0.0008</i>	<i>0.9345</i>
<i>MD = 80%</i>	<i>0.9294</i>	<i>0.0008</i>	<i>0.9310</i>
<i>MD = 90%</i>	<i>0.9201</i>	<i>0.0009</i>	<i>0.9219</i>
<i>MD = 100%</i>	<i>0.9074</i>	<i>0.0008</i>	<i>0.9090</i>
CE 14x14 Fort Calhoun, 1800 ppm boron, 24 Poison plates, 3.50 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.8944</i>	<i>0.0008</i>	<i>0.8960</i>
<i>MD = 50%</i>	<i>0.9183</i>	<i>0.0009</i>	<i>0.9201</i>
<i>MD = 55%</i>	<i>0.9227</i>	<i>0.0009</i>	<i>0.9245</i>
<i>MD = 60%</i>	<i>0.9280</i>	<i>0.0010</i>	<i>0.9300</i>
<i>MD = 65%</i>	<i>0.9312</i>	<i>0.0008</i>	<i>0.9328</i>
<i>MD = 70%</i>	<i>0.9316</i>	<i>0.0010</i>	<i>0.9336</i>
<i>MD = 80%</i>	<i>0.9285</i>	<i>0.0009</i>	<i>0.9303</i>
<i>MD = 90%</i>	<i>0.9219</i>	<i>0.0012</i>	<i>0.9243</i>
<i>MD = 100%</i>	<i>0.9119</i>	<i>0.0009</i>	<i>0.9137</i>
CE 14x14 Fort Calhoun, 1800 ppm boron, 24 Poison plates, 4.00 wt% U-235, 04 PRAs			
<i>MD = 40%</i>	<i>0.8890</i>	<i>0.0010</i>	<i>0.8910</i>
<i>MD = 50%</i>	<i>0.9144</i>	<i>0.0009</i>	<i>0.9162</i>
<i>MD = 60%</i>	<i>0.9295</i>	<i>0.0010</i>	<i>0.9315</i>
<i>MD = 65%</i>	<i>0.9339</i>	<i>0.0011</i>	<i>0.9361</i>
<i>MD = 70%</i>	<i>0.9359</i>	<i>0.0009</i>	<i>0.9377</i>
<i>MD = 75%</i>	<i>0.9342</i>	<i>0.0009</i>	<i>0.9360</i>
<i>MD = 80%</i>	<i>0.9347</i>	<i>0.0009</i>	<i>0.9365</i>
<i>MD = 90%</i>	<i>0.9305</i>	<i>0.0008</i>	<i>0.9321</i>
<i>MD = 100%</i>	<i>0.9227</i>	<i>0.0010</i>	<i>0.9247</i>

Table M.6-42
CE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)
(continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
CE 14x14 Fort Calhoun, 1800 ppm boron, 24 Poison plates, 4.35 wt% U-235, 08 PRAs			
MD = 40%	0.8761	0.0009	0.8779
MD = 50%	0.9037	0.0010	0.9057
MD = 60%	0.9213	0.0009	0.9231
MD = 70%	0.9323	0.0010	0.9343
MD = 75%	0.9338	0.0009	0.9356
MD = 80%	0.9329	0.0009	0.9347
MD = 85%	0.9331	0.0011	0.9353
MD = 90%	0.9310	0.0010	0.9330
MD = 100%	0.9292	0.0010	0.9312
CE 14x14 Fort Calhoun, 2000 ppm boron, 16 Poison plates, 3.50 wt% U-235, No PRAs			
MD = 40%	0.9055	0.0009	0.9073
MD = 50%	0.9275	0.0009	0.9293
MD = 55%	0.9315	0.0009	0.9333
MD = 60%	0.9329	0.0009	0.9347
MD = 65%	0.9335	0.0008	0.9351
MD = 70%	0.9315	0.0010	0.9335
MD = 75%	0.9290	0.0009	0.9308
MD = 80%	0.9258	0.0008	0.9274
MD = 90%	0.9152	0.0009	0.9170
MD = 100%	0.8999	0.0010	0.9019
CE 14x14 Fort Calhoun, 2000 ppm boron, 24 Poison plates, 3.70 wt% U-235, No PRAs			
MD = 40%	0.9011	0.0010	0.9031
MD = 50%	0.9201	0.0010	0.9221
MD = 55%	0.9277	0.0011	0.9299
MD = 60%	0.9310	0.0009	0.9328
MD = 65%	0.9340	0.0010	0.9360
MD = 70%	0.9342	0.0010	0.9362
MD = 80%	0.9284	0.0008	0.9300
MD = 90%	0.9200	0.0010	0.9220
MD = 100%	0.9079	0.0010	0.9099

Table M.6-42
CE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)
(continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
CE 14x14 Fort Calhoun, 2000 ppm boron, 24 Poison plates, 4.20 wt% U-235, 04 PRAs			
<i>MD = 40%</i>	0.8944	0.0009	0.8962
<i>MD = 50%</i>	0.9167	0.0010	0.9187
<i>MD = 60%</i>	0.9286	0.0010	0.9306
<i>MD = 65%</i>	0.9347	0.0010	0.9367
<i>MD = 70%</i>	0.9353	0.0010	0.9373
<i>MD = 75%</i>	0.9362	0.0009	0.9380
<i>MD = 80%</i>	0.9337	0.0009	0.9355
<i>MD = 90%</i>	0.9270	0.0008	0.9286
<i>MD = 100%</i>	0.9198	0.0010	0.9218
CE 14x14 Fort Calhoun, 2000 ppm boron, 24 Poison plates, 4.55 wt% U-235, 08 PRAs			
<i>MD = 40%</i>	0.8819	0.0009	0.8837
<i>MD = 50%</i>	0.9065	0.0009	0.9083
<i>MD = 60%</i>	0.9219	0.0009	0.9237
<i>MD = 70%</i>	0.9301	0.0010	0.9321
<i>MD = 75%</i>	0.9319	0.0009	0.9337
<i>MD = 80%</i>	0.9313	0.0010	0.9333
<i>MD = 85%</i>	0.9315	0.0009	0.9333
<i>MD = 90%</i>	0.9300	0.0009	0.9318
<i>MD = 100%</i>	0.9228	0.0009	0.9246
CE 14x14 Fort Calhoun, 2100 ppm boron, 16 Poison plates, 3.60 wt% U-235, No PRAs			
<i>MD = 40%</i>	0.9107	0.0010	0.9127
<i>MD = 50%</i>	0.9287	0.0008	0.9303
<i>MD = 55%</i>	0.9322	0.0008	0.9338
<i>MD = 60%</i>	0.9348	0.0010	0.9368
<i>MD = 65%</i>	0.9344	0.0010	0.9364
<i>MD = 70%</i>	0.9320	0.0009	0.9338
<i>MD = 75%</i>	0.9285	0.0009	0.9303
<i>MD = 80%</i>	0.9241	0.0009	0.9259
<i>MD = 90%</i>	0.9130	0.0009	0.9148
<i>MD = 100%</i>	0.8995	0.0009	0.9013

Table M.6-42
CE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)
 (continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
CE 14x14 Fort Calhoun, 2100 ppm boron, 24 Poison plates, 3.80 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9051</i>	<i>0.0009</i>	<i>0.9069</i>
<i>MD = 50%</i>	<i>0.9262</i>	<i>0.0008</i>	<i>0.9278</i>
<i>MD = 55%</i>	<i>0.9305</i>	<i>0.0010</i>	<i>0.9325</i>
<i>MD = 60%</i>	<i>0.9346</i>	<i>0.0009</i>	<i>0.9364</i>
<i>MD = 65%</i>	<i>0.9336</i>	<i>0.0010</i>	<i>0.9356</i>
<i>MD = 70%</i>	<i>0.9329</i>	<i>0.0009</i>	<i>0.9347</i>
<i>MD = 80%</i>	<i>0.9271</i>	<i>0.0009</i>	<i>0.9289</i>
<i>MD = 90%</i>	<i>0.9185</i>	<i>0.0009</i>	<i>0.9203</i>
<i>MD = 100%</i>	<i>0.9083</i>	<i>0.0009</i>	<i>0.9101</i>
CE 14x14 Fort Calhoun, 2100 ppm boron, 24 Poison plates, 4.30 wt% U-235, 04 PRAs			
<i>MD = 40%</i>	<i>0.8977</i>	<i>0.0009</i>	<i>0.8995</i>
<i>MD = 50%</i>	<i>0.9202</i>	<i>0.0011</i>	<i>0.9224</i>
<i>MD = 60%</i>	<i>0.9292</i>	<i>0.0009</i>	<i>0.9310</i>
<i>MD = 65%</i>	<i>0.9350</i>	<i>0.0010</i>	<i>0.9370</i>
<i>MD = 70%</i>	<i>0.9355</i>	<i>0.0010</i>	<i>0.9375</i>
<i>MD = 75%</i>	<i>0.9342</i>	<i>0.0009</i>	<i>0.9360</i>
<i>MD = 80%</i>	<i>0.9311</i>	<i>0.0009</i>	<i>0.9329</i>
<i>MD = 90%</i>	<i>0.9269</i>	<i>0.0011</i>	<i>0.9291</i>
<i>MD = 100%</i>	<i>0.9170</i>	<i>0.0009</i>	<i>0.9188</i>
CE 14x14 Fort Calhoun, 2100 ppm boron, 24 Poison plates, 4.70 wt% U-235, 08 PRAs			
<i>MD = 40%</i>	<i>0.8863</i>	<i>0.0009</i>	<i>0.8881</i>
<i>MD = 50%</i>	<i>0.9114</i>	<i>0.0009</i>	<i>0.9132</i>
<i>MD = 60%</i>	<i>0.9268</i>	<i>0.0010</i>	<i>0.9288</i>
<i>MD = 70%</i>	<i>0.9322</i>	<i>0.0009</i>	<i>0.9340</i>
<i>MD = 75%</i>	<i>0.9328</i>	<i>0.0009</i>	<i>0.9346</i>
<i>MD = 80%</i>	<i>0.9327</i>	<i>0.0010</i>	<i>0.9347</i>
<i>MD = 85%</i>	<i>0.9316</i>	<i>0.0010</i>	<i>0.9336</i>
<i>MD = 90%</i>	<i>0.9301</i>	<i>0.0010</i>	<i>0.9321</i>
<i>MD = 100%</i>	<i>0.9228</i>	<i>0.0012</i>	<i>0.9252</i>

Table M.6-42
CE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)
(continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
CE 14x14 Fort Calhoun, 2200 ppm boron, 16 Poison plates, 3.70 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9126</i>	<i>0.0009</i>	<i>0.9144</i>
<i>MD = 50%</i>	<i>0.9305</i>	<i>0.0009</i>	<i>0.9323</i>
<i>MD = 55%</i>	<i>0.9330</i>	<i>0.0009</i>	<i>0.9348</i>
<i>MD = 60%</i>	<i>0.9357</i>	<i>0.0010</i>	<i>0.9377</i>
<i>MD = 65%</i>	<i>0.9346</i>	<i>0.0010</i>	<i>0.9366</i>
<i>MD = 70%</i>	<i>0.9330</i>	<i>0.0009</i>	<i>0.9348</i>
<i>MD = 75%</i>	<i>0.9298</i>	<i>0.0009</i>	<i>0.9316</i>
<i>MD = 80%</i>	<i>0.9246</i>	<i>0.0009</i>	<i>0.9264</i>
<i>MD = 90%</i>	<i>0.9131</i>	<i>0.0009</i>	<i>0.9149</i>
<i>MD = 100%</i>	<i>0.8991</i>	<i>0.0009</i>	<i>0.9009</i>
CE 14x14 Fort Calhoun, 2200 ppm boron, 24 Poison plates, 3.90 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9064</i>	<i>0.0009</i>	<i>0.9082</i>
<i>MD = 50%</i>	<i>0.9269</i>	<i>0.0009</i>	<i>0.9287</i>
<i>MD = 55%</i>	<i>0.9334</i>	<i>0.0008</i>	<i>0.9350</i>
<i>MD = 60%</i>	<i>0.9341</i>	<i>0.0009</i>	<i>0.9359</i>
<i>MD = 65%</i>	<i>0.9357</i>	<i>0.0010</i>	<i>0.9377</i>
<i>MD = 70%</i>	<i>0.9356</i>	<i>0.0009</i>	<i>0.9374</i>
<i>MD = 80%</i>	<i>0.9294</i>	<i>0.0010</i>	<i>0.9314</i>
<i>MD = 90%</i>	<i>0.9197</i>	<i>0.0009</i>	<i>0.9215</i>
<i>MD = 100%</i>	<i>0.9050</i>	<i>0.0009</i>	<i>0.9068</i>
CE 14x14 Fort Calhoun, 2200 ppm boron, 24 Poison plates, 4.40 wt% U-235, 04 PRAs			
<i>MD = 40%</i>	<i>0.8993</i>	<i>0.0009</i>	<i>0.9011</i>
<i>MD = 50%</i>	<i>0.9196</i>	<i>0.0009</i>	<i>0.9214</i>
<i>MD = 60%</i>	<i>0.9319</i>	<i>0.0009</i>	<i>0.9337</i>
<i>MD = 65%</i>	<i>0.9356</i>	<i>0.0009</i>	<i>0.9374</i>
<i>MD = 70%</i>	<i>0.9340</i>	<i>0.0009</i>	<i>0.9358</i>
<i>MD = 75%</i>	<i>0.9316</i>	<i>0.0009</i>	<i>0.9334</i>
<i>MD = 80%</i>	<i>0.9314</i>	<i>0.0009</i>	<i>0.9332</i>
<i>MD = 90%</i>	<i>0.9236</i>	<i>0.0010</i>	<i>0.9256</i>
<i>MD = 100%</i>	<i>0.9163</i>	<i>0.0011</i>	<i>0.9185</i>

Table M.6-42
CE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)
(continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
CE 14x14 Fort Calhoun, 2200 ppm boron, 24 Poison plates, 4.80 wt% U-235, 08 PRAs			
MD = 40%	0.8875	0.0009	0.8893
MD = 50%	0.9123	0.0010	0.9143
MD = 60%	0.9262	0.0010	0.9282
MD = 65%	0.9294	0.0009	0.9312
MD = 70%	0.9326	0.0010	0.9346
MD = 75%	0.9318	0.0010	0.9338
MD = 80%	0.9316	0.0009	0.9334
MD = 85%	0.9316	0.0010	0.9336
MD = 90%	0.9284	0.0011	0.9306
MD = 100%	0.9213	0.0009	0.9231
CE 14x14 Fort Calhoun, 2300 ppm boron, 16 Poison plates, 3.75 wt% U-235, No PRAs			
MD = 40%	0.9120	0.0009	0.9138
MD = 50%	0.9296	0.0008	0.9312
MD = 55%	0.9330	0.0008	0.9346
MD = 60%	0.9350	0.0010	0.9370
MD = 65%	0.9328	0.0009	0.9346
MD = 70%	0.9289	0.0009	0.9307
MD = 75%	0.9265	0.0009	0.9283
MD = 80%	0.9202	0.0010	0.9222
MD = 90%	0.9094	0.0009	0.9112
MD = 100%	0.8927	0.0009	0.8945
CE 14x14 Fort Calhoun, 2300 ppm boron, 24 Poison plates, 4.00 wt% U-235, No PRAs			
MD = 40%	0.9112	0.0009	0.9130
MD = 50%	0.9296	0.0008	0.9312
MD = 55%	0.9330	0.0008	0.9346
MD = 60%	0.9352	0.0009	0.9370
MD = 65%	0.9358	0.0010	0.9378
MD = 70%	0.9349	0.0009	0.9367
MD = 80%	0.9270	0.0010	0.9290
MD = 90%	0.9182	0.0009	0.9200
MD = 100%	0.9071	0.0010	0.9091

Table M.6-42
CE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)
(continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
CE 14x14 Fort Calhoun, 2300 ppm boron, 24 Poison plates, 4.50 wt% U-235, 04 PRAs			
MD = 40%	0.9008	0.0009	0.9026
MD = 50%	0.9227	0.0009	0.9245
MD = 60%	0.9325	0.0009	0.9343
MD = 65%	0.9340	0.0008	0.9356
MD = 70%	0.9343	0.0010	0.9363
MD = 75%	0.9332	0.0009	0.9350
MD = 80%	0.9308	0.0010	0.9328
MD = 90%	0.9242	0.0009	0.9260
MD = 100%	0.9139	0.0009	0.9157
CE 14x14 Fort Calhoun, 2300 ppm boron, 24 Poison plates, 4.90 wt% U-235, 08 PRAs			
MD = 40%	0.8906	0.0008	0.8922
MD = 50%	0.9113	0.0010	0.9133
MD = 60%	0.9265	0.0009	0.9283
MD = 65%	0.9310	0.0011	0.9332
MD = 70%	0.9329	0.0009	0.9347
MD = 75%	0.9323	0.0009	0.9341
MD = 80%	0.9313	0.0009	0.9331
MD = 85%	0.9293	0.0009	0.9311
MD = 90%	0.9279	0.0012	0.9303
MD = 100%	0.9183	0.0010	0.9203
CE 14x14 Fort Calhoun, 2400 ppm boron, 16 Poison plates, 3.80 wt% U-235, No PRAs			
MD = 40%	0.9110	0.0009	0.9128
MD = 50%	0.9280	0.0008	0.9296
MD = 55%	0.9315	0.0009	0.9333
MD = 60%	0.9310	0.0009	0.9328
MD = 65%	0.9302	0.0011	0.9324
MD = 70%	0.9278	0.0009	0.9296
MD = 75%	0.9215	0.0008	0.9231
MD = 80%	0.9184	0.0010	0.9204
MD = 90%	0.9047	0.0009	0.9065
MD = 100%	0.8896	0.0009	0.8914

Table M.6-42
CE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)
 (continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
CE 14x14 Fort Calhoun, 2400 ppm boron, 24 Poison plates, 4.05 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9112</i>	<i>0.0010</i>	<i>0.9132</i>
<i>MD = 50%</i>	<i>0.9276</i>	<i>0.0010</i>	<i>0.9296</i>
<i>MD = 55%</i>	<i>0.9319</i>	<i>0.0010</i>	<i>0.9339</i>
<i>MD = 60%</i>	<i>0.9326</i>	<i>0.0010</i>	<i>0.9346</i>
<i>MD = 65%</i>	<i>0.9335</i>	<i>0.0009</i>	<i>0.9353</i>
<i>MD = 70%</i>	<i>0.9306</i>	<i>0.0009</i>	<i>0.9324</i>
<i>MD = 80%</i>	<i>0.9242</i>	<i>0.0010</i>	<i>0.9262</i>
<i>MD = 90%</i>	<i>0.9136</i>	<i>0.0009</i>	<i>0.9154</i>
<i>MD = 100%</i>	<i>0.8999</i>	<i>0.0009</i>	<i>0.9017</i>
CE 14x14 Fort Calhoun, 2400 ppm boron, 24 Poison plates, 4.60 wt% U-235, 04 PRAs			
<i>MD = 40%</i>	<i>0.9035</i>	<i>0.0009</i>	<i>0.9053</i>
<i>MD = 50%</i>	<i>0.9241</i>	<i>0.0009</i>	<i>0.9259</i>
<i>MD = 60%</i>	<i>0.9323</i>	<i>0.0010</i>	<i>0.9343</i>
<i>MD = 65%</i>	<i>0.9349</i>	<i>0.0009</i>	<i>0.9367</i>
<i>MD = 70%</i>	<i>0.9355</i>	<i>0.0010</i>	<i>0.9375</i>
<i>MD = 75%</i>	<i>0.9352</i>	<i>0.0009</i>	<i>0.9370</i>
<i>MD = 80%</i>	<i>0.9297</i>	<i>0.0009</i>	<i>0.9315</i>
<i>MD = 90%</i>	<i>0.9234</i>	<i>0.0009</i>	<i>0.9252</i>
<i>MD = 100%</i>	<i>0.9116</i>	<i>0.0008</i>	<i>0.9132</i>
CE 14x14 Fort Calhoun, 2400 ppm boron, 24 Poison plates, 5.00 wt% U-235, 08 PRAs			
<i>MD = 40%</i>	<i>0.8911</i>	<i>0.0010</i>	<i>0.8931</i>
<i>MD = 50%</i>	<i>0.9143</i>	<i>0.0009</i>	<i>0.9161</i>
<i>MD = 60%</i>	<i>0.9260</i>	<i>0.0009</i>	<i>0.9278</i>
<i>MD = 65%</i>	<i>0.9283</i>	<i>0.0010</i>	<i>0.9303</i>
<i>MD = 70%</i>	<i>0.9315</i>	<i>0.0011</i>	<i>0.9337</i>
<i>MD = 75%</i>	<i>0.9301</i>	<i>0.0010</i>	<i>0.9321</i>
<i>MD = 80%</i>	<i>0.9305</i>	<i>0.0009</i>	<i>0.9323</i>
<i>MD = 85%</i>	<i>0.9293</i>	<i>0.0010</i>	<i>0.9313</i>
<i>MD = 90%</i>	<i>0.9247</i>	<i>0.0010</i>	<i>0.9267</i>
<i>MD = 100%</i>	<i>0.9176</i>	<i>0.0010</i>	<i>0.9196</i>

Table M.6-42
CE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)
(concluded)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
CE 14x14 Fort Calhoun, 2500 ppm boron, 16 Poison plates, 3.90 wt% U-235, No PRAs			
MD = 40%	0.9141	0.0008	0.9157
MD = 50%	0.9289	0.0009	0.9307
MD = 55%	0.9321	0.0010	0.9341
MD = 60%	0.9315	0.0009	0.9333
MD = 65%	0.9308	0.0010	0.9328
MD = 70%	0.9272	0.0009	0.9290
MD = 80%	0.9162	0.0008	0.9178
MD = 90%	0.9051	0.0008	0.9067
MD = 100%	0.8893	0.0008	0.8909
CE 14x14 Fort Calhoun, 2500 ppm boron, 24 Poison plates, 4.15 wt% U-235, No PRAs			
MD = 40%	0.9133	0.0009	0.9151
MD = 50%	0.9302	0.0009	0.9320
MD = 55%	0.9333	0.0009	0.9351
MD = 60%	0.9338	0.0010	0.9358
MD = 65%	0.9336	0.0011	0.9358
MD = 70%	0.9338	0.0010	0.9358
MD = 80%	0.9247	0.0009	0.9265
MD = 90%	0.9131	0.0008	0.9147
MD = 100%	0.9001	0.0009	0.9019
CE 14x14 Fort Calhoun, 2500 ppm boron, 24 Poison plates, 4.70 wt% U-235, 04 PRAs			
MD = 40%	0.9075	0.0009	0.9093
MD = 50%	0.9245	0.0010	0.9265
MD = 60%	0.9335	0.0010	0.9355
MD = 65%	0.9347	0.0009	0.9365
MD = 70%	0.9346	0.0008	0.9362
MD = 75%	0.9320	0.0008	0.9336
MD = 80%	0.9287	0.0010	0.9307
MD = 90%	0.9226	0.0009	0.9244
MD = 100%	0.9098	0.0009	0.9116

Table M.6-43
WE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
WE 14x14 ZCA/ZCB, 1800 ppm boron, 16 Poison plates, 3.55 wt% U-235, No PRAs			
MD = 40%	0.9125	0.0009	0.9143
MD = 50%	0.9284	0.0010	0.9304
MD = 55%	0.9315	0.0010	0.9335
MD = 60%	0.9312	0.0010	0.9332
MD = 65%	0.9329	0.0011	0.9351
MD = 70%	0.9325	0.0010	0.9345
MD = 80%	0.9253	0.0009	0.9271
MD = 90%	0.9153	0.0010	0.9173
MD = 100%	0.9052	0.0010	0.9072
WE 14x14 ZCA/ZCB, 1800 ppm boron, 24 Poison plates, 3.75 wt% U-235, No PRAs			
MD = 40%	0.9034	0.0012	0.9058
MD = 50%	0.9241	0.0010	0.9261
MD = 55%	0.9283	0.0010	0.9303
MD = 60%	0.9304	0.0010	0.9324
MD = 65%	0.9333	0.0012	0.9357
MD = 70%	0.9351	0.0011	0.9373
MD = 75%	0.9337	0.0010	0.9357
MD = 80%	0.9325	0.0011	0.9347
MD = 90%	0.9259	0.0010	0.9279
MD = 100%	0.9183	0.0010	0.9203
WE 14x14 ZCA/ZCB, 1800 ppm boron, 24 Poison plates, 4.40 wt% U-235, 04 PRAs			
MD = 40%	0.8927	0.0010	0.8947
MD = 50%	0.9158	0.0010	0.9178
MD = 60%	0.9276	0.0010	0.9296
MD = 65%	0.9321	0.0010	0.9341
MD = 70%	0.9328	0.0010	0.9348
MD = 75%	0.9335	0.0010	0.9355
MD = 80%	0.9348	0.0009	0.9366
MD = 85%	0.9332	0.0009	0.9350
MD = 90%	0.9302	0.0009	0.9320
MD = 100%	0.9251	0.0011	0.9273

Table M.6-43
WE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)

(continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
WE 14x14 ZCA/ZCB, 2000 ppm boron, 16 Poison plates, 3.75 wt% U-235, No PRAs			
MD = 40%	0.9192	0.0009	0.9210
MD = 50%	0.9305	0.0009	0.9323
MD = 55%	0.9338	0.0010	0.9358
MD = 60%	0.9351	0.0009	0.9369
MD = 65%	0.9337	0.0009	0.9355
MD = 70%	0.9297	0.0009	0.9315
MD = 80%	0.9232	0.0010	0.9252
MD = 90%	0.9119	0.0008	0.9135
MD = 100%	0.8991	0.0009	0.9009
WE 14x14 ZCA/ZCB, 2000 ppm boron, 24 Poison plates, 3.90 wt% U-235, No PRAs			
MD = 40%	0.9037	0.0010	0.9057
MD = 50%	0.9235	0.0010	0.9255
MD = 55%	0.9286	0.0011	0.9308
MD = 60%	0.9295	0.0009	0.9313
MD = 65%	0.9310	0.0011	0.9332
MD = 70%	0.9305	0.0010	0.9325
MD = 80%	0.9273	0.0009	0.9291
MD = 90%	0.9183	0.0009	0.9201
MD = 100%	0.9141	0.0009	0.9159
WE 14x14 ZCA/ZCB, 2000 ppm boron, 24 Poison plates, 4.60 wt% U-235, 04 PRAs			
MD = 40%	0.8969	0.0009	0.8987
MD = 50%	0.9175	0.0009	0.9193
MD = 60%	0.9269	0.0011	0.9291
MD = 65%	0.9309	0.0009	0.9327
MD = 70%	0.9310	0.0011	0.9332
MD = 75%	0.9315	0.0009	0.9333
MD = 80%	0.9304	0.0010	0.9324
MD = 85%	0.9267	0.0009	0.9285
MD = 90%	0.9258	0.0010	0.9278
MD = 100%	0.9191	0.0009	0.9209

Table M.6-43
WE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)
(continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
WE 14x14 ZCA/ZCB, 2100 ppm boron, 16 Poison plates, 3.80 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9173</i>	<i>0.0009</i>	<i>0.9191</i>
<i>MD = 50%</i>	<i>0.9284</i>	<i>0.0009</i>	<i>0.9302</i>
<i>MD = 55%</i>	<i>0.9324</i>	<i>0.0009</i>	<i>0.9342</i>
<i>MD = 60%</i>	<i>0.9315</i>	<i>0.0011</i>	<i>0.9337</i>
<i>MD = 65%</i>	<i>0.9292</i>	<i>0.0009</i>	<i>0.9310</i>
<i>MD = 70%</i>	<i>0.9280</i>	<i>0.0010</i>	<i>0.9300</i>
<i>MD = 80%</i>	<i>0.9180</i>	<i>0.0010</i>	<i>0.9200</i>
<i>MD = 90%</i>	<i>0.9086</i>	<i>0.0010</i>	<i>0.9106</i>
<i>MD = 100%</i>	<i>0.8954</i>	<i>0.0010</i>	<i>0.8974</i>
WE 14x14 ZCA/ZCB, 2100 ppm boron, 24 Poison plates, 4.00 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9096</i>	<i>0.0011</i>	<i>0.9118</i>
<i>MD = 50%</i>	<i>0.9260</i>	<i>0.0009</i>	<i>0.9278</i>
<i>MD = 55%</i>	<i>0.9295</i>	<i>0.0010</i>	<i>0.9315</i>
<i>MD = 60%</i>	<i>0.9329</i>	<i>0.0009</i>	<i>0.9347</i>
<i>MD = 65%</i>	<i>0.9321</i>	<i>0.0010</i>	<i>0.9341</i>
<i>MD = 70%</i>	<i>0.9322</i>	<i>0.0009</i>	<i>0.9340</i>
<i>MD = 80%</i>	<i>0.9256</i>	<i>0.0011</i>	<i>0.9278</i>
<i>MD = 90%</i>	<i>0.9193</i>	<i>0.0009</i>	<i>0.9211</i>
<i>MD = 100%</i>	<i>0.9071</i>	<i>0.0010</i>	<i>0.9091</i>
WE 14x14 ZCA/ZCB, 2100 ppm boron, 24 Poison plates, 4.75 wt% U-235, 04 PRAs			
<i>MD = 40%</i>	<i>0.9021</i>	<i>0.0011</i>	<i>0.9043</i>
<i>MD = 50%</i>	<i>0.9197</i>	<i>0.0009</i>	<i>0.9215</i>
<i>MD = 60%</i>	<i>0.9308</i>	<i>0.0008</i>	<i>0.9324</i>
<i>MD = 65%</i>	<i>0.9340</i>	<i>0.0009</i>	<i>0.9358</i>
<i>MD = 70%</i>	<i>0.9349</i>	<i>0.0010</i>	<i>0.9369</i>
<i>MD = 75%</i>	<i>0.9332</i>	<i>0.0010</i>	<i>0.9352</i>
<i>MD = 80%</i>	<i>0.9316</i>	<i>0.0009</i>	<i>0.9334</i>
<i>MD = 90%</i>	<i>0.9267</i>	<i>0.0011</i>	<i>0.9289</i>
<i>MD = 100%</i>	<i>0.9185</i>	<i>0.0011</i>	<i>0.9207</i>

Table M.6-43
WE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)
(continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
WE 14x14 ZCA/ZCB, 2200 ppm boron, 16 Poison plates, 3.90 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9200</i>	<i>0.0009</i>	<i>0.9218</i>
<i>MD = 50%</i>	<i>0.9315</i>	<i>0.0009</i>	<i>0.9333</i>
<i>MD = 55%</i>	<i>0.9330</i>	<i>0.0008</i>	<i>0.9346</i>
<i>MD = 60%</i>	<i>0.9329</i>	<i>0.0010</i>	<i>0.9349</i>
<i>MD = 65%</i>	<i>0.9310</i>	<i>0.0008</i>	<i>0.9326</i>
<i>MD = 70%</i>	<i>0.9276</i>	<i>0.0010</i>	<i>0.9296</i>
<i>MD = 80%</i>	<i>0.9180</i>	<i>0.0009</i>	<i>0.9198</i>
<i>MD = 90%</i>	<i>0.9073</i>	<i>0.0009</i>	<i>0.9091</i>
<i>MD = 100%</i>	<i>0.8936</i>	<i>0.0008</i>	<i>0.8952</i>
WE 14x14 ZCA/ZCB, 2200 ppm boron, 24 Poison plates, 4.10 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9099</i>	<i>0.0010</i>	<i>0.9119</i>
<i>MD = 50%</i>	<i>0.9271</i>	<i>0.0010</i>	<i>0.9291</i>
<i>MD = 55%</i>	<i>0.9314</i>	<i>0.0010</i>	<i>0.9334</i>
<i>MD = 60%</i>	<i>0.9333</i>	<i>0.0011</i>	<i>0.9355</i>
<i>MD = 65%</i>	<i>0.9324</i>	<i>0.0010</i>	<i>0.9344</i>
<i>MD = 70%</i>	<i>0.9331</i>	<i>0.0011</i>	<i>0.9353</i>
<i>MD = 80%</i>	<i>0.9276</i>	<i>0.0010</i>	<i>0.9296</i>
<i>MD = 90%</i>	<i>0.9175</i>	<i>0.0011</i>	<i>0.9197</i>
<i>MD = 100%</i>	<i>0.9062</i>	<i>0.0010</i>	<i>0.9082</i>
WE 14x14 ZCA/ZCB, 2200 ppm boron, 24 Poison plates, 4.85 wt% U-235, 04 PRAs			
<i>MD = 40%</i>	<i>0.9021</i>	<i>0.0010</i>	<i>0.9041</i>
<i>MD = 50%</i>	<i>0.9226</i>	<i>0.0009</i>	<i>0.9244</i>
<i>MD = 60%</i>	<i>0.9317</i>	<i>0.0012</i>	<i>0.9341</i>
<i>MD = 65%</i>	<i>0.9330</i>	<i>0.0010</i>	<i>0.9350</i>
<i>MD = 70%</i>	<i>0.9335</i>	<i>0.0010</i>	<i>0.9355</i>
<i>MD = 75%</i>	<i>0.9316</i>	<i>0.0010</i>	<i>0.9336</i>
<i>MD = 80%</i>	<i>0.9311</i>	<i>0.0010</i>	<i>0.9331</i>
<i>MD = 90%</i>	<i>0.9254</i>	<i>0.0009</i>	<i>0.9272</i>
<i>MD = 100%</i>	<i>0.9160</i>	<i>0.0011</i>	<i>0.9182</i>

Table M.6-43
WE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)
(continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
WE 14x14 ZCA/ZCB, 2300 ppm boron, 16 Poison plates, 4.00 wt% U-235, No PRAs			
MD = 40%	0.9222	0.0009	0.9240
MD = 50%	0.9311	0.0008	0.9327
MD = 55%	0.9341	0.0010	0.9361
MD = 60%	0.9345	0.0009	0.9363
MD = 65%	0.9310	0.0009	0.9328
MD = 70%	0.9274	0.0009	0.9292
MD = 80%	0.9183	0.0009	0.9201
MD = 90%	0.9060	0.0010	0.9080
MD = 100%	0.8934	0.0009	0.8952
WE 14x14 ZCA/ZCB, 2300 ppm boron, 24 Poison plates, 4.20 wt% U-235, No PRAs			
MD = 40%	0.9140	0.0009	0.9158
MD = 50%	0.9295	0.0010	0.9315
MD = 55%	0.9344	0.0011	0.9366
MD = 60%	0.9336	0.0009	0.9354
MD = 65%	0.9337	0.0009	0.9355
MD = 70%	0.9322	0.0011	0.9344
MD = 80%	0.9256	0.0010	0.9276
MD = 90%	0.9185	0.0010	0.9205
MD = 100%	0.9049	0.0009	0.9067
WE 14x14 ZCA/ZCB, 2300 ppm boron, 24 Poison plates, 5.00 wt% U-235, 04 PRAs			
MD = 40%	0.9076	0.0009	0.9094
MD = 50%	0.9260	0.0009	0.9278
MD = 60%	0.9323	0.0009	0.9341
MD = 65%	0.9350	0.0009	0.9368
MD = 70%	0.9356	0.0010	0.9376
MD = 75%	0.9333	0.0011	0.9355
MD = 80%	0.9313	0.0010	0.9333
MD = 90%	0.9240	0.0010	0.9260
MD = 100%	0.9157	0.0010	0.9177

Table M.6-43
WE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)
(continued)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
WE 14x14 ZCA/ZCB, 2400 ppm boron, 16 Poison plates, 4.10 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9243</i>	<i>0.0010</i>	<i>0.9263</i>
<i>MD = 50%</i>	<i>0.9343</i>	<i>0.0009</i>	<i>0.9361</i>
<i>MD = 55%</i>	<i>0.9354</i>	<i>0.0010</i>	<i>0.9374</i>
<i>MD = 60%</i>	<i>0.9344</i>	<i>0.0010</i>	<i>0.9364</i>
<i>MD = 65%</i>	<i>0.9318</i>	<i>0.0008</i>	<i>0.9334</i>
<i>MD = 70%</i>	<i>0.9286</i>	<i>0.0009</i>	<i>0.9304</i>
<i>MD = 80%</i>	<i>0.9185</i>	<i>0.0009</i>	<i>0.9203</i>
<i>MD = 90%</i>	<i>0.9060</i>	<i>0.0009</i>	<i>0.9078</i>
<i>MD = 100%</i>	<i>0.8917</i>	<i>0.0008</i>	<i>0.8933</i>
WE 14x14 ZCA/ZCB, 2400 ppm boron, 24 Poison plates, 4.30 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9166</i>	<i>0.0009</i>	<i>0.9184</i>
<i>MD = 50%</i>	<i>0.9305</i>	<i>0.0010</i>	<i>0.9325</i>
<i>MD = 55%</i>	<i>0.9330</i>	<i>0.0010</i>	<i>0.9350</i>
<i>MD = 60%</i>	<i>0.9334</i>	<i>0.0010</i>	<i>0.9354</i>
<i>MD = 65%</i>	<i>0.9335</i>	<i>0.0010</i>	<i>0.9355</i>
<i>MD = 70%</i>	<i>0.9327</i>	<i>0.0011</i>	<i>0.9349</i>
<i>MD = 80%</i>	<i>0.9250</i>	<i>0.0011</i>	<i>0.9272</i>
<i>MD = 90%</i>	<i>0.9147</i>	<i>0.0010</i>	<i>0.9167</i>
<i>MD = 100%</i>	<i>0.9044</i>	<i>0.0010</i>	<i>0.9064</i>

Table M.6-43
WE 14x14 Class Assembly Final Results (16 or 24 Poison Plate Configurations, Variable Soluble Boron Concentration)
(concluded)

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>k_{eff}</i>
WE 14x14 ZCA/ZCB, 2500 ppm boron, 16 Poison plates, 4.15 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9253</i>	<i>0.0010</i>	<i>0.9273</i>
<i>MD = 50%</i>	<i>0.9329</i>	<i>0.0009</i>	<i>0.9347</i>
<i>MD = 55%</i>	<i>0.9333</i>	<i>0.0011</i>	<i>0.9355</i>
<i>MD = 60%</i>	<i>0.9314</i>	<i>0.0010</i>	<i>0.9334</i>
<i>MD = 65%</i>	<i>0.9285</i>	<i>0.0009</i>	<i>0.9303</i>
<i>MD = 70%</i>	<i>0.9250</i>	<i>0.0010</i>	<i>0.9270</i>
<i>MD = 80%</i>	<i>0.9137</i>	<i>0.0009</i>	<i>0.9155</i>
<i>MD = 90%</i>	<i>0.9013</i>	<i>0.0009</i>	<i>0.9031</i>
<i>MD = 100%</i>	<i>0.8859</i>	<i>0.0010</i>	<i>0.8879</i>
WE 14x14 ZCA/ZCB, 2500 ppm boron, 24 Poison plates, 4.40 wt% U-235, No PRAs			
<i>MD = 40%</i>	<i>0.9191</i>	<i>0.0010</i>	<i>0.9211</i>
<i>MD = 50%</i>	<i>0.9314</i>	<i>0.0010</i>	<i>0.9334</i>
<i>MD = 55%</i>	<i>0.9353</i>	<i>0.0010</i>	<i>0.9373</i>
<i>MD = 60%</i>	<i>0.9332</i>	<i>0.0008</i>	<i>0.9348</i>
<i>MD = 65%</i>	<i>0.9335</i>	<i>0.0010</i>	<i>0.9355</i>
<i>MD = 70%</i>	<i>0.9318</i>	<i>0.0010</i>	<i>0.9338</i>
<i>MD = 80%</i>	<i>0.9226</i>	<i>0.0010</i>	<i>0.9246</i>
<i>MD = 90%</i>	<i>0.9155</i>	<i>0.0010</i>	<i>0.9175</i>
<i>MD = 100%</i>	<i>0.9032</i>	<i>0.0010</i>	<i>0.9052</i>

Table M.6-44
CE 15x15 Class Assembly, 1" Plugging Cluster Comparison

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>1" Rod k_{KENO}</i>	<i>1σ</i>	<i>Difference</i>	<i>σ</i>
40% IMD	0.9089	0.0010	0.9083	0.0009	-0.0006	0.0013
50% IMD	0.9277	0.0010	0.9289	0.0010	0.0012	0.0014
60% IMD	0.9362	0.0011	0.9351	0.0009	-0.0011	0.0014
70% IMD	0.9360	0.0010	0.9354	0.0010	-0.0005	0.0014
80% IMD	0.9322	0.0008	0.9304	0.0008	-0.0018	0.0011
90% IMD	0.9236	0.0009	0.9230	0.0010	-0.0007	0.0014
100% IMD	0.9140	0.0010	0.9113	0.0009	-0.0027	0.0013
40% IMD	0.9138	0.0009	0.9138	0.0008	0.0000	0.0013
50% IMD	0.9305	0.0008	0.9303	0.0008	-0.0002	0.0012
60% IMD	0.9359	0.0009	0.9381	0.0010	0.0022	0.0013
70% IMD	0.9383	0.0009	0.9363	0.0010	-0.0019	0.0013
80% IMD	0.9310	0.0008	0.9304	0.0009	-0.0006	0.0012
90% IMD	0.9237	0.0009	0.9246	0.0010	0.0010	0.0013
100% IMD	0.9133	0.0008	0.9114	0.0009	-0.0018	0.0012
40% IMD	0.9128	0.0008	0.9140	0.0009	0.0012	0.0012
50% IMD	0.9305	0.0010	0.9307	0.0010	0.0002	0.0014
60% IMD	0.9366	0.0009	0.9355	0.0011	-0.0011	0.0014
70% IMD	0.9359	0.0010	0.9348	0.0009	-0.0010	0.0013
80% IMD	0.9293	0.0008	0.9300	0.0008	0.0007	0.0012
90% IMD	0.9203	0.0009	0.9193	0.0010	-0.0009	0.0014
100% IMD	0.9080	0.0008	0.9086	0.0009	0.0006	0.0012

Table M.6-45
CE 15x15 Class Assembly, 11' Plugging Cluster Comparison

<i>Model Description</i>	<i>k_{KENO}</i>	<i>1σ</i>	<i>11' Rod k_{KENO}</i>	<i>1σ</i>	<i>Difference</i>	<i>σ</i>
40% IMD	0.9089	0.0010	0.8998	0.0009	-0.0091	0.0013
50% IMD	0.9277	0.0010	0.9182	0.0009	-0.0095	0.0014
60% IMD	0.9362	0.0011	0.9273	0.0009	-0.0090	0.0014
70% IMD	0.9360	0.0010	0.9302	0.0010	-0.0058	0.0014
80% IMD	0.9322	0.0008	0.9267	0.0009	-0.0055	0.0012
90% IMD	0.9236	0.0009	0.9186	0.0010	-0.0051	0.0013
100% IMD	0.9140	0.0010	0.9086	0.0010	-0.0054	0.0014
40% IMD	0.9138	0.0009	0.9042	0.0011	-0.0096	0.0014
50% IMD	0.9305	0.0008	0.9231	0.0010	-0.0074	0.0013
60% IMD	0.9359	0.0009	0.9316	0.0009	-0.0043	0.0012
70% IMD	0.9383	0.0009	0.9327	0.0008	-0.0055	0.0012
80% IMD	0.9310	0.0008	0.9274	0.0009	-0.0036	0.0012
90% IMD	0.9237	0.0009	0.9200	0.0010	-0.0036	0.0014
100% IMD	0.9133	0.0008	0.9085	0.0010	-0.0048	0.0013
40% IMD	0.9128	0.0008	0.9050	0.0008	-0.0078	0.0011
50% IMD	0.9305	0.0010	0.9221	0.0009	-0.0084	0.0013
60% IMD	0.9366	0.0009	0.9293	0.0010	-0.0073	0.0013
70% IMD	0.9359	0.0010	0.9288	0.0010	-0.0071	0.0014
80% IMD	0.9293	0.0008	0.9257	0.0011	-0.0036	0.0014
90% IMD	0.9203	0.0009	0.9163	0.0008	-0.0039	0.0012
100% IMD	0.9080	0.0008	0.9054	0.0010	-0.0025	0.0012

ATTACHMENT C-2

Updated FSAR Revision 7 Changed Pages

Revisions indicated relative to Updated FSAR, Revision 7. Listed below are the affected FSAR Appendix N pages:

- Page N.2-2
- Page N.2-2a (New)
- Page N.2-7
- Page N.2-9
- Page N.5-1
- Page N.5-1a (New)
- Page N.6-1 thru N.6-3
- Page N.6-5
- Page N.6-6
- Page N.6-27
- Page N.6-39a thru N.6-39i (New)
- Page N.6-40
- Page N.6-46 thru N.6-49 (New)

N.2.1 Spent Fuel to be Stored

There are two design configurations for the NUHOMS®-24PHB DSC: the 24PHBS and 24PHBL, which are nearly identical to the standard and long cavity 24P DSCs, respectively. Each of the DSC configurations is designed to store 24 intact *PWR* fuel assemblies, including reconstituted assemblies with characteristics described in Table N.2-1. The 24PHBL DSC is designed to store 24 intact B&W 15x15, *WE 17x17*, *WE 15x15*, *CE 14x14*, and *WE 14x14 Class* *PWR* fuel assemblies. *BPRAs are allowed only in the B&W 15x15 fuel assembly. Replacement assemblies by other manufacturers are also allowed provided they meet limiting features listed in Table N.2-1.*

The NUHOMS®-24PHB DSC may store *PWR* fuel assemblies arranged in one of two alternate Heat Load Zoning Configurations with a maximum decay heat of 1.3 kW per assembly and a maximum heat load of 24 kW per DSC. The Heat Load Zoning Configurations are shown in Figure N.2-1 and Figure N.2-2. The NUHOMS®-24PHB DSC is vacuum dried and backfilled with helium at the time of loading. The maximum (*bounding*) fuel assembly weight of 1682 lbs with a BPRA is identical to the NUHOMS®-24P DSC design.

The maximum fuel cladding temperature limit of 400°C (752°F) is applicable to normal conditions of storage and all short term operations from spent fuel pool to ISFSI pad including vacuum drying and helium backfilling of the 24PHB DSC per Interim Staff Guidance (ISG) No. 11, Revision 2 [2.6]. In addition, ISG-11 does not permit thermal cycling of the fuel cladding with temperature differences greater than 65°C (117°F) during DSC drying, backfilling and transfer operations.

The maximum fuel cladding temperature limit of 570°C (1058°F) is applicable to accidents or off-normal thermal transients [2.6].

The information provided in Table N.2-1 is based on *the design basis* B&W 15x15 fuel *which is the bounding fuel assembly*. The types of spent fuel considered in Appendix N include the following:

- B&W 15x15 Mark B2, B3, B4, B4Z, B5, B5Z, B6, B7, B8, B9 and B10 fuel assemblies.
- B&W 15x15 reconstituted fuel assemblies with a maximum of 10 stainless steel rods per assembly or unlimited number of lower enrichment UO₂ rods instead of zircaloy clad enriched UO₂ rods. The stainless steel rods are assumed to have two thirds the irradiation time as the zircaloy rods of the assembly. The reconstituted UO₂ rods are assumed to have the same irradiation history as the entire fuel assembly. The reconstituted rods can be at any location in the fuel assemblies. The maximum number of reconstituted fuel assemblies per DSC is four.
- The standard BPRA design for the B&W 15x15 class assemblies is described in Appendix J.
- *WE 17x17, WE 15x15, CE 14x14 and WE 14x14 fuel assemblies, all with no BPRAs.*

Calculations are performed to determine the fuel assembly type which is most limiting for each of the analyses including shielding, criticality, heat load and confinement. *Analyses performed*

demonstrated that limiting features associated with the design basis B&W 15x15 fuel assembly are bounding for assembly types listed in Table N.2-1.

N.2.1.1 General Operating Functions

No change.

N.2.5 Summary of NUHOMS®-24PHB DSC Design Criteria

The NUHOMS®-24PHB DSC is designed to store 24 intact B&W 15x15, *WE 17x17*, *WE 15x15*, *CE 14x14*, and *WE 14x14 Class* PWR fuel assemblies with assembly average burnup, initial enrichment and cooling time as described in Table N.2-1. *BPRAs are allowed only in the B&W 15x15 fuel assembly. The B&W 15x15 fuel assembly is the bounding assembly for the structural, thermal, shielding, criticality and confinement evaluations.* The maximum total heat generation rate of the stored fuel is limited to 1.3 kW per fuel assembly and 24 kW per NUHOMS®-24PHB DSC in order to ensure cladding integrity [2.6]. The fuel cladding integrity is assured by the NUHOMS®-24PHB DSC and basket design which limits fuel cladding temperature and maintains a nonoxidizing environment in the cask cavity as described in Section N.4.

The NUHOMS®-24PHB DSC design, fabrication and testing are covered by TN's Quality Assurance Program, which conforms to the criteria in Subpart G of 10CFR72. The criteria used to design and fabricate the NUHOMS®-24PHB DSC (shell and closure) are described in Section 3.2.5.2. The basket (which includes the spacer disc, the support rods, guide sleeves, over sleeves and their associated welds) is also designed and fabricated following the criteria provided in Section 3.2.5.2.

The NUHOMS®-24PHB DSC is designed to maintain a subcritical configuration during loading, handling, storage and accident conditions. A combination of soluble boron in the pool and favorable geometry are employed to maintain the upper subcritical limit of 0.9413. The required soluble boron concentration in the 24PHB DSC cavity as a function of the initial U-235 enrichment is given in Figure N.2-3.

The NUHOMS®-24PHB DSC is designed to withstand the effects of severe environmental conditions and natural phenomena such as earthquakes, tornadoes, lightning and floods. Section N.11 describes the NUHOMS®-24PHB DSC behavior under these accident conditions.

Table N.2-1
PWR Fuel Specifications for Fuel to be Stored in the
NUHOMS®-24PHB DSC

Title or Parameter	Specifications
<p>Fuel</p> <p><i>Only intact, unconsolidated B&W 15x15 (with or without BPRAs), WE 17x17, WE 15x15, CE 14x14 and WE 14x14 Class PWR fuel assemblies (all without BPRAs) or equivalent reload fuel manufactured by other vendor, with the following requirements:</i></p> <p><i>Maximum No. of Reconstituted Assemblies per DSC with Stainless Steel rods</i></p> <p><i>Maximum No. of Stainless Steel Rods per Reconstituted Assembly</i></p> <p><i>Maximum No. of Reconstituted Assemblies per DSC with low enriched uranium oxide rods</i></p>	<p>4</p> <p>10</p> <p>24</p>
<p>Physical Parameters (without BPRAs)</p> <p>Maximum Assembly Length (unirradiated)</p> <p>Nominal Cross-Sectional Envelope</p> <p>Maximum Assembly Weight</p> <p>No. of Assemblies per DSC</p> <p>Fuel Cladding</p>	<p>165.785 in (24PHBS DSC) 171.96 in (24PHBL DSC)</p> <p>8.536 in</p> <p>1682 lbs</p> <p>≤ 24 intact assemblies</p> <p>Zircalloy-clad fuel with no known or suspected gross cladding breaches</p>
<p>Physical Parameters (with BPRAs)</p> <p>Maximum Assembly + BPRA Length (unirradiated)</p> <p>Nominal Cross-Sectional Envelope</p> <p>Maximum Assembly + BPRA Weight</p> <p>No. of Assemblies per DSC</p> <p>No. of BPRAs per DSC</p> <p>Fuel Cladding</p>	<p>171.96 in (24PHBL DSC)</p> <p>8.536 in</p> <p>1682 lbs</p> <p>≤ 24 intact assemblies</p> <p>≤ 24 BPRAs</p> <p>Zircalloy-clad fuel with no known or suspected gross cladding breaches</p>
<p>Nuclear Parameters</p> <p><i>Maximum Fuel Initial Enrichment</i></p> <p><i>Maximum Initial Uranium loading per assembly</i></p> <p><i>Allowable loading configurations for each 24PHB DSC</i></p> <p><i>Burnup, Enrichment, and Minimum Cooling Time for Configuration 1 (Figure N.2-1)</i></p> <p><i>Burnup, Enrichment, and Minimum Cooling Time for Configuration 2 (Figure N.2-2)</i></p> <p><i>Minimum Cooling Time for BPRAs</i></p> <p><i>Total Decay Heat per DSC</i></p> <p><i>Decay Heat Limits for Zone 1, 2 and 3 fuel</i></p>	<p>4.5 wt. % U-235</p> <p>0.490 MTU</p> <p>As specified in Figure N.2-1 or Figure N.2-2</p> <p>Table N.2-3 for Zone 1 fuel; Table N.2-4 for Zone 2 fuel; Table N.2-5 for Zone 3 fuel</p> <p>Table N.2-5 for Zone 3 fuel</p> <p>5 years</p> <p>24 kW</p> <p>As specified in Figure N.2-1 and Figure N.2-2.</p>

N.5 Shielding Evaluation

The shielding evaluation for the Standardized NUHOMS® System (during loading, transfer and storage) for the 24P and 52B canisters is discussed in Sections 3.3.5, 7.0 and 8.0. The following evaluation specifically addresses the bounding dose rates due to design basis B&W 15x15 PWR fuel and Burnable Poison Rod Assemblies (BPRAs) loaded in a NUHOMS®-24PHB DSC. The fuel assemblies and BPRA characteristics are described in Section N.2-1.

The shielding analysis is performed for the two DSC configurations (24PHBS and 24PHBL) of the NUHOMS®-24PHB System described in Section N.2.1. The basket layout for these two DSC configurations is identical except for the shield plug design and length of the DSC components. For shielding purposes, the 24PHBL DSC bounds the 24PHBS DSC because of the additional gamma source due to the BPRAs. Therefore, the dose rates calculated for the 24PHBL DSC with fuel plus BPRAs bound the dose rates for the 24PHBS DSC with fuel. The 24PHBL optional configuration, which consists of the integral cover plate/shield plug forging assemblies in lieu of separate cover plates/lead shield plugs, is also evaluated. Where dose rates are higher for this option the higher dose rates are provided. The dose rates for this optional configuration are calculated using the same methods and codes as those calculated for the other configurations.

The 24PHB DSC also allows storage of WE 17 x 17, WE 15 x 15, WE 14 x 14 and CE 14 x 14 fuel assemblies without BPRAs. The B&W 15 x 15 fuel assembly is the bounding assembly for shielding analysis because it has the highest initial heavy metal loading.

The design basis PWR fuel source terms are derived from the bounding fuel, B&W 15x15 Mark B 10 assembly design as described in Section N.5.2. The information provided in the Table N.5-1 is based on B&W 15x15 fuel. The types of spent fuel considered in this Appendix include the following:

- B&W 15x15 Mark B2, B3, B4, B4Z, B5, B5Z, B6, B7, B8, B9 and B10 fuel assemblies.
- B&W 15x15 reconstituted fuel assemblies with a maximum of 10 stainless steel rods or unlimited number of zircaloy clad lower enriched UO₂ rods instead of zircaloy clad UO₂ rods. (Note that lower enriched UO₂ rods are of similar design and behavior as the standard fuel rod aside from the uranium enrichment.) The reconstituted rods can be at any location in the fuel assemblies. The maximum number of reconstituted fuel assemblies per DSC is four. The reconstituted assemblies can be placed anywhere in the basket.
- Standard BPRA design for the B&W 15x15 class assemblies *are as* listed in Appendix J.
- *WE 17 x 17, WE 15 x 15, CE 14 x 14 and WE 14 x 14 class PWR fuel assemblies, all with no BPRAs.*

Note that while the B&W fuel types are specifically listed, storing reload fuel designed by other manufacturers is also allowed provided an analysis is performed to demonstrate that the limiting features listed in *Table N.2-1* bound the specific manufacturers replacement fuel.

The design basis fuel source terms for this evaluation bound the source terms from fuel with the burnup/initial enrichment/cooling time combination given in Table N.2-3 through Table N.2-5 (with or without BPRAs and with or without reconstituted fuel assemblies) and located in the basket as shown in Figure N.2-1 and Figure N.2-2. This evaluation bounds the maximum dose rate on the surface of the HSM (Model 102) and Standard, OS197 or OS197H Transfer Cask (TC). The source terms for the BPRAs are the same as given in Appendix J for the B&W 15x15 BPRAs. The approach used to assure that the neutron and gamma source spectrum and the source terms used, bound the fuel allowed per the fuel qualification tables is consistent with that used for the Standardized NUHOMS[®]-24P and -52B canister designs as described in Section 7.3.2.

N.6 Criticality Evaluation

The design criteria for the NUHOMS®-24PHB DSC requires that the fuel loaded in the DSC remain subcritical under normal and accident conditions as defined in 10CFR Part 72.

The NUHOMS®-24PHB DSC system's criticality safety is ensured by soluble boron in the pool and favorable geometry.

The 24PHBL DSC also includes an optional top and bottom end design which consists of an integral cover plate/shield plug forging assembly in lieu of separate cover plates/lead shield plug. This option is called the "shifted shielding" option for 24PHBL DSC because a portion of the lead is shifted from the bottom shield plug to the top shield plug. The cavity length for the optional shifted shielding 24PHBL DSC increases by ¼".

The criticality analysis for the 24PHB DSC is performed using only the active fuel length and the upper plenum regions explicitly modeled. The presence of fuel assembly components above and below these regions is modeled as borated water. These same models are also applicable to 24PHBL DSC with shifted shielding option and therefore, these analysis results are also applicable to the optional shifted shielding 24PHBL DSC.

This criticality analysis is performed for the fuel types listed below:

<i>Assembly Class</i>	<i>Assembly Type⁽¹⁾</i>
<i>B&W 15x15</i>	<i>B&W 15x15 Mark B Fuel Assembly (all versions including B2 through B10). The Mark B10 is the Design Basis Assembly.</i>
<i>WE 17x17</i>	<i>Westinghouse 17x17 LOPAR/Std</i>
	<i>Westinghouse 17x17 OFA/Vantage 5, +⁽²⁾</i>
<i>WE 15x15</i>	<i>Westinghouse 15x15 Std/ZC</i>
	<i>Exxon/ANF 15x15 WE</i>
<i>CE 14x14</i>	<i>CE 14x14 Standard/Generic</i>
	<i>CE 14x14 Fort Calhoun</i>
<i>WE 14x14</i>	<i>Westinghouse 14x14 ZCA/ZCB</i>
	<i>Westinghouse 14x14 OFA</i>
	<i>Exxon/ANF 14x14 WE</i>

1. Reload fuel from other manufacturers are also acceptable.

2. Includes all Vantage versions (5, +, ++, etc.,)

KENO-Va (CSAS25 of SCALE 4.4) [6.1] is used to demonstrate that the most reactive fuel assembly (B&W 15x15 Mark B10, with and without BPRAs) with a maximum initial enrichment of 4.5 wt. % U-235 is bounded by the upper subcritical limit (USL) for storage in the NUHOMS®-24PHB system. Maximum initial enrichment corresponds to the peak pellet enrichment in the assembly. The analysis includes an evaluation of both Heat Load Zoning Configuration 1 (Figure N.2-1) and Configuration 2 (Figure N.2-2) with up to ten stainless steel rods or any number of zircaloy clad lower enriched uranium oxide rods. The analysis is performed with soluble boron in the DSC cavity and with pure water or void in the fuel-cladding gap and upper plenum region.

N.6.1 Discussion and Results

The results demonstrate that the required minimum boron loading will maintain the system reactivity below *the USL*. This is demonstrated by modeling the most reactive fuel assembly (*B&W 15x15 Mark B10*, with and without BPRAs) with pure water or void in the fuel-cladding gap and upper plenum region in a canister flooded with borated water with a moderator density range of 0.0001 g/cc to approximately 1.0 g/cc.

The evaluation assumes 24 unirradiated B&W 15x15 Mark B10 fuel assemblies for Heat Load Zoning Configuration 1 with up to 4.5 wt. % enriched U-235 fuel pins in borated water. Evaluations are performed to determine the minimum boron loading as a function of initial U-235 enrichment. Three parameters are included: moderator density, contents of guide tubes and instrument tubes, and the fuel-cladding gap contents. Consistent with the criticality analysis presented in Appendix J, it is assumed that a comparison of fuel assemblies with and without BPRAs is bounded by modeling the volumes that could be occupied by BPRAs as filled with $^{11}\text{B}_4\text{C}$. This is done to bound the reactivity effects of BPRAs stored with fuel. Modeling the BPRAs as $^{11}\text{B}_4\text{C}$ is appropriate since the net effect is to substitute material with a very small thermal absorption cross section for material that in reality would have some remaining B_{10} . The scattering or moderating effect of pure $^{11}\text{B}_4\text{C}$ is very similar to Zircaloy. In addition, the instrument tubes are conservatively assumed to be filled with $^{11}\text{B}_4\text{C}$. It is assumed that 100% dense pure water fills the fuel-cladding gap and upper plenum region. A series of calculations are also performed with void in the cladding gap and plenum regions to determine the bounding condition.

Evaluations are also performed to demonstrate that the following conditions are bounded by the worst-case k_{eff} determined for the system.

- Storage of up to four reconstituted fuel assemblies per DSC. The reconstituted fuel is assumed to contain up to 10 stainless steel rods or natural UO_2 rods that replace the same number of zircaloy clad fueled rods.
- Leaving the four center assembly locations empty for Heat Load Zoning Configuration 2.

N.6.2 Package Fuel Loading

The package fuel loading for the 24PHB DSC remains unchanged from previous analysis presented in Section 3.3.4.1 and Appendix J.

The B&W 15x15 fuel assembly design parameters and layout used in this evaluation are given in Table N.6-1, Table N.6-2, Table N.6-3, Table N.6-4, and Figure N.6-1.

The WE 17x17 fuel assembly design parameters and layout used in this evaluation are given in Table N.6-17, Table N.6-18, and Figure N.6-7.

The WE 15x15 fuel assembly design parameters and layout used in this evaluation are given in Table N.6-19, Table N.6-20 and Figure N.6-8.

The CE 14x14 fuel assembly design parameters and layout used in this evaluation are given in Table N.6-21, Table N.6-22 and Figure N.6-9.

The WE 14x14 fuel assembly design parameters and layout used in this evaluation are given in Table N.6-23, Table N.6-24, Table N.6-25 and Figure N.6-10.

- Only the active fuel length and the upper plenum region are explicitly modeled. The presence of fuel assembly components above and below these regions is modeled as borated water because the top and bottom nozzle regions have statistically insignificant effect on k_{eff} .
- The most material condition was assumed for the over sleeves. Parasitic neutron absorption in the thicker steel sheets is offset by the decreased absorption in the displaced borated water. The least material condition was assumed for the guide sleeve thickness. This allowed for the fuel assemblies to be pushed as far inward as possible.

The KENO models consist of 1586 axial layers stacked into an array. The layers consist of partial spacer disk or partial moderator regions inside and outside of the active fuel region and upper plenum region as presented in Figure N.6-2. The very top and bottom layers of the model are the DSC steel cylinders. The DSC model contains 8 spacer disk regions, each 2 inches thick, surrounded by a total of 9 non-disk regions. The center-to-center spacing of the spacer disk intervals varies over a range from 5.5 inches to 22.6 inches. A 12 inch water differential albedo boundary condition is used for all cases.

UNIT 33 is a slice through the cask at the DSC spacer disk level. UNIT 34 is a slice through the moderator region between spacer disks as shown in Figure N.6-3. UNIT 37 is a slice through the moderator region between the spacer disks including the over sleeve. UNIT 134 is a slice through the moderator region between the spacer disks at the plenum height. UNIT 137 is a slice through the moderator region between the spacer disks including the over sleeve at the plenum height. UNIT numbers 1-8 are used to represent the active fuel assemblies in both the spacer disk region and in the moderator region. Units 100-800 are used to represent the plenum region in both the spacer disk region and in the moderator region. The fuel assemblies are inserted into the model using KENO's HOLE capability.

The total number of reconstituted fuel assemblies stored in the NUHOMS®-24PHB system is limited to 4. Reconstituted assemblies have a maximum of 10 solid stainless steel rods and no limit for zircaloy clad natural UO_2 rods. Ten stainless steel rods were modeled in each reconstituted fuel assembly with a diameter of 0.418 inches. The zircaloy clad natural UO_2 rods are bounded by the fully enriched rod evaluations.

No attempt has been made to model fission products, burnable poisons, or axial and radial variations in initial fuel enrichment. Instead, fuel assemblies have been modeled as if they were composed of only a single enrichment unirradiated fuel. This assumption results in a very large margin of conservatism in the calculated k_{eff} .

All calculations were performed using SCALE4.4 [6.1], CSAS25 and the 44-group ENDF/B-V cross section library.

The dimensional data with worst-case tolerances for the NUHOMS®-24PHB DSC used in the CSAS25 (KENO-Va) models is given in Table N.6-5. A quarter-core layout of fuel assemblies, support tie rods and stainless shell is shown in Table N.6-4.

N.6.4 Criticality Analysis

Models are developed for each of the fuel assembly types bounded. These models are used to determine the most reactive fuel assembly type. The results of this study are presented in Table N.6-6 along with the geometry dimensions that varied between the assembly types. Otherwise, all models had the same geometry and were analyzed at 1.0 g/cc water density, a boron loading of 2950 ppm, and a UO_2 enrichment of 4.5 wt. % U-235. The *B&W 15x15 MKB8* model is representative of the early *B&W 15x15 MKB* assembly types (B2 through B7), therefore the *B&W 15x15 MKB8* model is *assumed to represent B&W 15x15 MK2 through MK8*. Based on these results, the B&W 15x15 Mark B10 fuel assembly is selected as the most reactive assembly type and used in the moderator density studies to determine the worst case system k_{eff} .

This assembly is also used to determine the minimum boron loading as a function of enrichments from 4.0 wt. % U-235 to 4.5 wt. % U-235. The results for the required minimum boron loading for various enrichments are given in Table N.6-13.

The maximum k_{eff} for the NUHOMS®-24PHB was determined to be 0.9386 ± 0.0010 ($0.9406 \pm 2 \sigma$) for fuel with an initial enrichment of 4.0 wt.% U-235 with pure water in the fuel-cladding gap and upper plenum region, no BPRAs, internal moderation at 0.4 g/cc, and a boron loading of 2350 ppm. Therefore, the maximum final k_{eff} (0.9406) in the moderator density in the range of 0.0001 g/cc to approximately 1.0 g/cc, meets the USL criteria of less than 0.9413 as defined in Section N.6.5. The criticality results are presented in Figure N.6-5 and Figure N.6-6. Table N.6-7 through Table N.6-13 presents the results for each set of KENO cases.

Table N.6-6
Criticality Results (Fuel Assembly Comparison)

Fuel Type	Fuel Density (%TD)	Pellet O.D. (in)	Cladding Thickness (in)	k_{KENO}	1σ
<i>B&W 15x15 Mark B2 through B8</i>	95.0	0.3686	0.0265	0.8145	0.0010
<i>B&W 15x15 Mark B9</i>	95.0	0.37	0.0265	0.8169	0.0010
<i>B&W 15x15 Mark B10</i>	96.0	0.3735	0.025	0.8241	0.0009
<i>Westinghouse 17x17 LOPAR/Sid</i>	96.0	0.3225	0.0225	0.8142	0.0009
<i>Westinghouse 17x17 OFA/Vantage S, +⁽¹⁾</i>	96.0	0.3088	0.0225	0.7884	0.0011
<i>Westinghouse 15x15 Sid/ZC</i>	96.0	0.3559	0.0242	0.7941	0.0009
<i>Exxon/ANF 15x15 WE</i>	96.0	0.3565	0.03	0.7918	0.0010
<i>CE 14x14 Standard/Generic</i>	96.0	0.3765	0.028	0.7541	0.0009
<i>CE 14x14 Fort Calhoun</i>	96.0	0.3815	0.028	0.7589	0.0009
<i>Westinghouse 14x14 ZCA/ZCB</i>	96.0	0.3659	0.0225	0.7574	0.0009
<i>Westinghouse 14x14 OFA</i>	96.0	0.3444	0.0243	0.7253	0.0009
<i>Exxon/ANF 14x14 WE</i>	96.0	0.3505	0.03	0.7356	0.0010

(1) Includes all Vantage versions (S, +, ++, etc.,)

Table N.6-17
WE 17x17 LOPAR/Std Fuel Assembly

<i>Parameter</i>	<i>Value</i>
<i>Maximum number of fuel rods</i>	<i>264</i>
<i>Fuel density, % theoretical</i>	<i>96.0%</i>
<i>Quantity of guide tubes</i>	<i>24</i>
<i>Quantity of instrument tubes</i>	<i>1</i>

<i>Parameter</i>	<i>Inches</i>	<i>cm</i>
<i>Pellet diameter</i>	<i>0.3225</i>	<i>0.81915</i>
<i>Cladding thickness</i>	<i>0.0225</i>	<i>0.05715</i>
<i>Fuel rod OD</i>	<i>0.374</i>	<i>0.94996</i>
<i>Fuel rod pitch</i>	<i>0.496</i>	<i>1.25984</i>
<i>Guide tube OD</i>	<i>0.474</i>	<i>1.20396</i>
<i>Guide tube ID</i>	<i>0.422</i>	<i>1.07188</i>
<i>Instrument tube OD</i>	<i>0.480</i>	<i>1.2192</i>
<i>Instrument tube ID</i>	<i>0.450</i>	<i>1.143</i>

Note: Reload fuel from other manufacturers with these parameters are also acceptable.

Table N.6-18
WE 17x17 OFA/Vantage (all types) Fuel Assembly

<i>Parameter</i>	<i>Value</i>
<i>Maximum number of fuel rods</i>	<i>264</i>
<i>Fuel density, % theoretical</i>	<i>96.0%</i>
<i>Quantity of guide tubes</i>	<i>24</i>
<i>Quantity of instrument tubes</i>	<i>1</i>

<i>Parameter</i>	<i>Inches</i>	<i>cm</i>
<i>Pellet diameter</i>	<i>0.3088</i>	<i>0.78435</i>
<i>Cladding thickness</i>	<i>0.0225</i>	<i>0.05715</i>
<i>Fuel rod OD</i>	<i>0.360</i>	<i>0.9144</i>
<i>Fuel rod pitch</i>	<i>0.496</i>	<i>1.25984</i>
<i>Guide tube OD</i>	<i>0.482</i>	<i>1.22428</i>
<i>Guide tube ID</i>	<i>0.450</i>	<i>1.143</i>
<i>Instrument tube OD</i>	<i>0.476</i>	<i>1.20904</i>
<i>Instrument tube ID</i>	<i>0.460</i>	<i>1.1684</i>

Note: Includes all Vantage versions (5,+,++, etc.,) and reload fuel from other manufacturers with these parameters are also acceptable.

Table N.6-19
WE 15x15 Std/ZC Fuel Assembly

<i>Parameter</i>	<i>Value</i>
<i>Maximum number of fuel rods</i>	<i>204</i>
<i>Fuel density, % theoretical</i>	<i>96.0%</i>
<i>Quantity of guide tubes</i>	<i>20</i>
<i>Quantity of instrument tubes</i>	<i>1</i>

<i>Parameter</i>	<i>Inches</i>	<i>cm</i>
<i>Pellet diameter</i>	<i>0.3559</i>	<i>0.90399</i>
<i>Cladding thickness</i>	<i>0.0242</i>	<i>0.06147</i>
<i>Fuel rod OD</i>	<i>0.422</i>	<i>1.07188</i>
<i>Fuel rod pitch</i>	<i>0.563</i>	<i>1.43002</i>
<i>Guide tube OD</i>	<i>0.546</i>	<i>1.38684</i>
<i>Guide tube ID</i>	<i>0.512</i>	<i>1.30048</i>
<i>Instrument tube OD</i>	<i>0.546</i>	<i>1.38684</i>
<i>Instrument tube ID</i>	<i>0.512</i>	<i>1.30048</i>

Note: Reload fuel from other manufacturers with these parameters are also acceptable.

Table N.6-20
Exxon/ANF 15x15 WE Fuel Assembly

<i>Parameter</i>	<i>Value</i>
<i>Maximum number of fuel rods</i>	<i>204</i>
<i>Fuel density, % theoretical</i>	<i>96.0%</i>
<i>Quantity of guide tubes</i>	<i>20</i>
<i>Quantity of instrument tubes</i>	<i>1</i>

<i>Parameter</i>	<i>Inches</i>	<i>cm</i>
<i>Pellet diameter</i>	<i>0.3565</i>	<i>0.90551</i>
<i>Cladding thickness</i>	<i>0.03</i>	<i>0.0762</i>
<i>Fuel rod OD</i>	<i>0.424</i>	<i>1.07696</i>
<i>Fuel rod pitch</i>	<i>0.563</i>	<i>1.43002</i>
<i>Guide tube OD</i>	<i>0.544</i>	<i>1.38176</i>
<i>Guide tube ID</i>	<i>0.510</i>	<i>1.2954</i>
<i>Instrument tube OD</i>	<i>0.544</i>	<i>1.38176</i>
<i>Instrument tube ID</i>	<i>0.510</i>	<i>1.2954</i>

Note: Reload fuel from other manufacturers with these parameters are also acceptable.

Table N.6-21
CE 14x14 Standard/Generic Fuel Assembly

<i>Parameter</i>	<i>Value</i>
<i>Maximum number of fuel rods</i>	<i>204</i>
<i>Fuel density, % theoretical</i>	<i>96.0%</i>
<i>Quantity of guide tubes</i>	<i>20</i>
<i>Quantity of instrument tubes</i>	<i>1</i>

<i>Parameter</i>	<i>Inches</i>	<i>cm</i>
<i>Pellet diameter</i>	<i>0.3765</i>	<i>0.95631</i>
<i>Cladding thickness</i>	<i>0.028</i>	<i>0.07112</i>
<i>Fuel rod OD</i>	<i>0.440</i>	<i>1.1176</i>
<i>Fuel rod pitch</i>	<i>0.580</i>	<i>1.4732</i>
<i>Guide tube OD</i>	<i>Modeled as Water/no Tube</i>	
<i>Guide tube ID</i>		
<i>Instrument tube OD</i>	<i>NA</i>	<i>NA</i>
<i>Instrument tube ID</i>	<i>NA</i>	<i>NA</i>

Note: Reload fuel from other manufacturers with these parameters are also acceptable.

Table N.6-22
CE 14x14 Fort Calhoun Fuel Assembly

<i>Parameter</i>	<i>Value</i>
<i>Maximum number of fuel rods</i>	<i>204</i>
<i>Fuel density, % theoretical</i>	<i>96.0%</i>
<i>Quantity of guide tubes</i>	<i>20</i>
<i>Quantity of instrument tubes</i>	<i>1</i>

<i>Parameter</i>	<i>Inches</i>	<i>cm</i>
<i>Pellet diameter</i>	<i>0.3815</i>	<i>0.96901</i>
<i>Cladding thickness</i>	<i>0.028</i>	<i>0.07112</i>
<i>Fuel rod OD</i>	<i>0.440</i>	<i>1.1176</i>
<i>Fuel rod pitch</i>	<i>0.580</i>	<i>1.4732</i>
<i>Guide tube OD</i>	<i>Modeled as Water/no Tube</i>	
<i>Guide tube ID</i>		
<i>Instrument tube OD</i>	<i>NA</i>	<i>NA</i>
<i>Instrument tube ID</i>	<i>NA</i>	<i>NA</i>

Note: Reload fuel from other manufacturers with these parameters are also acceptable.

Table N.6-23
WE 14x14 ZCA/ZCB Fuel Assembly

<i>Parameter</i>	<i>Value</i>
<i>Maximum number of fuel rods</i>	<i>179</i>
<i>Fuel density, % theoretical</i>	<i>96.0%</i>
<i>Quantity of guide tubes</i>	<i>16</i>
<i>Quantity of instrument tubes</i>	<i>1</i>

<i>Parameter</i>	<i>Inches</i>	<i>cm</i>
<i>Pellet diameter</i>	<i>0.3659</i>	<i>0.92939</i>
<i>Cladding thickness</i>	<i>0.0225</i>	<i>0.05715</i>
<i>Fuel rod OD</i>	<i>0.422</i>	<i>1.07188</i>
<i>Fuel rod pitch</i>	<i>0.556</i>	<i>1.41224</i>
<i>Guide tube OD⁽¹⁾</i>	<i>0.539</i>	<i>1.36906</i>
<i>Guide tube ID</i>	<i>0.505</i>	<i>1.2827</i>
<i>Instrument tube OD</i>	<i>0.422</i>	<i>1.07188</i>
<i>Instrument tube ID</i>	<i>0.392</i>	<i>0.99568</i>

(1) Note that the OD of the Guide Tube is modeled slightly larger (1.372294 cm), this is conservative and does not effect the conclusions of the evaluation.

Note: Reload fuel from other manufacturers with these parameters are also acceptable.

Table N.6-24
WE 14x14 OFA Fuel Assembly

<i>Parameter</i>	<i>Value</i>
<i>Maximum number of fuel rods</i>	<i>179</i>
<i>Fuel density, % theoretical</i>	<i>96.0%</i>
<i>Quantity of guide tubes</i>	<i>16</i>
<i>Quantity of instrument tubes</i>	<i>1</i>

<i>Parameter</i>	<i>Inches</i>	<i>cm</i>
<i>Pellet diameter</i>	<i>0.3444</i>	<i>0.87478</i>
<i>Cladding thickness</i>	<i>0.0243</i>	<i>0.06172</i>
<i>Fuel rod OD</i>	<i>0.400</i>	<i>1.016</i>
<i>Fuel rod pitch</i>	<i>0.556</i>	<i>1.41224</i>
<i>Guide tube OD</i>	<i>0.526</i>	<i>1.33605</i>
<i>Guide tube ID</i>	<i>0.492</i>	<i>1.24968</i>
<i>Instrument tube OD</i>	<i>0.400</i>	<i>1.016</i>
<i>Instrument tube ID</i>	<i>0.353</i>	<i>0.89662</i>

Note: Reload fuel from other manufacturers with these parameters are also acceptable.

Table N.6-25
Exxon/ANF 14x14 WE Fuel Assembly

<i>Parameter</i>	<i>Value</i>
<i>Maximum number of fuel rods</i>	<i>179</i>
<i>Fuel density, % theoretical</i>	<i>96.0%</i>
<i>Quantity of guide tubes</i>	<i>16</i>
<i>Quantity of instrument tubes</i>	<i>1</i>

<i>Parameter</i>	<i>Inches</i>	<i>cm</i>
<i>Pellet diameter</i>	<i>0.3505</i>	<i>0.89027</i>
<i>Cladding thickness</i>	<i>0.03</i>	<i>0.0762</i>
<i>Fuel rod OD</i>	<i>0.424</i>	<i>1.07696</i>
<i>Fuel rod pitch</i>	<i>0.556</i>	<i>1.41224</i>
<i>Guide tube OD</i>	<i>0.541</i>	<i>1.37414</i>
<i>Guide tube ID</i>	<i>0.507</i>	<i>1.28778</i>
<i>Instrument tube OD</i>	<i>0.480</i>	<i>1.2192</i>
<i>Instrument tube ID</i>	<i>0.448</i>	<i>1.13792</i>

Note: Reload fuel from other manufacturers with these parameters are also acceptable.

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	2	1	1	1	2	1	1	1	1	1
1	1	1	2	1	1	1	1	1	1	1	2	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	2	1	1	2	1	1	1	2	1	1	2	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	3	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	2	1	1	2	1	1	1	2	1	1	2	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	2	1	1	1	1	1	1	1	2	1	1	1
1	1	1	1	1	2	1	1	1	2	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

1 = Fuel Rod
 2 = Guide Tube
 3 = Instrument Tube

Figure N.6-1
B&W 15x15 Class Assembly Layout

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	2	1	1	2	1	1	2	1	1	1	1	1	1
1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	2	1	1	2	1	1	3	1	1	2	1	1	2	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1
1	1	1	1	1	2	1	1	2	1	1	2	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

1 = Fuel Rod
 2 = Guide Tube
 3 = Instrument Tube

Figure N.6-7
WE 17x17 Class Assembly Layout

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	2	1	1	2	1	1	1	2	1	1	2	1	1
1	1	1	1	1	1	1	2	1	1	1	1	1	1	1
1	1	1	1	2	1	1	1	1	1	2	1	1	1	1
1	1	2	1	1	1	1	1	1	1	1	1	2	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	2	1	1	1	3	1	1	1	2	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	2	1	1	1	1	1	1	1	1	1	2	1	1
1	1	1	1	2	1	1	1	1	1	2	1	1	1	1
1	1	1	1	1	1	1	2	1	1	1	1	1	1	1
1	1	2	1	1	2	1	1	1	2	1	1	2	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

1 = Fuel Rod
 2 = Guide Tube
 3 = Instrument Tube

Figure N.6-8
WE 15x15 Class Assembly Layout

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1		2		1	1	1	1	1		2		1	1
1	1				1	1	1	1	1				1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1		2		1	1	1	1	1	1
1	1	1	1	1	1				1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1				1	1	1	1	1		2		1	1
1	1				1	1	1	1	1				1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

1 = Fuel Rod
2 = Guide Tube

Figure N.6-9
CE 14x14 Class Assembly Layout

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	2	1	1	2	1	1	2	1	1	2	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	2	1	1	1	1	2	1	1	1	1	1
1	1	2	1	1	1	1	1	1	1	1	2	1	1	1
1	1	1	1	1	1	1	3	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	2	1	1	1	1	1	1	1	1	2	1	1	1
1	1	1	1	2	1	1	1	1	2	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	2	1	1	2	1	1	2	1	1	2	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

1 = Fuel Rod
 2 = Guide Tube
 3 = Instrument Tube

Figure N.6-10
WE 14x14 Class Assembly Layout