

ATTACHMENT 2 TO CERTIFICATE OF COMPLIANCE NO. 1029

BASES FOR TECHNICAL SPECIFICATIONS FOR THE ADVANCED
NUHOMS[®] SYSTEM

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B 2.0 FUNCTIONAL AND OPERATING LIMITS

BASES

BACKGROUND

The 24PT1-DSC design requires certain limits on spent fuel parameters, including fuel type, maximum allowable enrichment prior to irradiation, maximum burnup, minimum acceptable cooling time prior to storage in the 24PT1-DSC, and physical condition of the spent fuel (i.e., intact or damaged fuel assemblies). Other important limitations are the radiological source terms from associated Rod Cluster Control Assemblies (RCCAs), Neutron Source Assemblies (NSAs), and Thimble Plug Assemblies (TPAs). These limitations are included in the thermal, structural, radiological, and criticality evaluations performed for the canister.

APPLICABLE SAFETY ANALYSIS

Various analyses have been performed that use these fuel parameters as assumptions. These assumptions are included in the thermal, criticality, structural, shielding and confinement analyses.

Technical Specification Tables 2-1, 2-2 and 2-3 provide the key fuel parameters that require confirmation prior to 24PT1-DSC loading.

FUNCTIONAL AND OPERATING LIMITS VIOLATIONS

If Functional and Operating Limits are violated, the limitations on the fuel assemblies in the canister have not been met. Actions must be taken to place the affected fuel assemblies in a safe condition. This safe condition may be established by returning the affected fuel assemblies to the spent fuel pool. However, it is acceptable for the affected fuel assemblies to remain in the canister if that is determined to be a safe condition.

Notification of the violation of a Functional and Operating Limit to the NRC is required within 24 hours. Written reporting of the violation must be accomplished within 30 days. This notification and written report are independent of any reports and notification that may be required by 10CFR 72.75.

REFERENCES

SAR Chapter 2

B 3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

BASES

LCOs LCO 3.0.1, 3.0.2, 3.0.4 and 3.0.5 establish the general requirements applicable to all Specifications and apply at all times, unless otherwise stated.

LCO 3.0.1 LCO 3.0.1 establishes the Applicability statement within each individual Specification as the requirement for when the LCO is required to be met (i.e., when the canister is in the specified conditions of the Applicability statement of each Specification).

LCO 3.0.2 LCO 3.0.2 establishes that upon discovery of a failure to meet an LCO, the associated ACTIONS shall be met. The Completion Time of each Required Action for an ACTIONS Condition is applicable from the point in time that an ACTIONS Condition is entered. The Required Actions establish those remedial measures that must be taken within specified Completion Times when the requirements of an LCO are not met. This Specification establishes that:

- a. Completion of the Required Actions within the specified Completion Times constitutes compliance with a Specification; and
- b. Completion of the Required Actions is not required when an LCO is met within the specified Completion Time, unless otherwise specified.

There are two basic types of Required Actions. The first type of Required Action specifies a time limit in which the LCO must be met. This time limit is the Completion Time to restore a system or component or to restore variables to within specified limits. If this type of Required Action is not completed within the specified Completion Time, the canister may have to be placed in the spent fuel pool and unloaded. (Whether stated as a Required Action or not, correction of the entered Condition is an action that may always be considered upon entering ACTIONS.) The second type of Required Action specifies the remedial measures that permit continued operation of the unit that is not further restricted by the Completion Time. In this case, compliance with the Required Actions provides an acceptable level of safety for continued operation.

Completing the Required Actions is not required when an LCO is met or is no longer applicable, unless otherwise stated in the individual Specifications.

The Completion Times of the Required Actions are also applicable when a system or component is removed from service intentionally. The reasons for intentionally relying on the ACTIONS include, but are not limited to,

performance of Surveillances, preventive maintenance, corrective maintenance, or investigation of operational problems. Entering ACTIONS for these reasons must be done in a manner that does not compromise safety. Intentional entry into ACTIONS should not be made for operational convenience.

Individual Specifications may specify a time limit for performing an SR when equipment is removed from service or bypassed for testing. In this case, the Completion Times of the Required Actions are applicable when this time limit expires if the equipment remains removed from service or bypassed.

When a change in specified condition is required to comply with Required Actions, the equipment may enter a specified condition in which another Specification becomes applicable. In this case, the Completion Times of the associated Required Actions would apply from the point in time that the new Specification becomes applicable and the ACTIONS Condition(s) are entered.

LCO 3.0.3 This specification is not applicable to the Advanced NUHOMS[®] System. The placeholder is retained for consistency with the power reactor technical specifications.

LCO 3.0.4 LCO 3.0.4 establishes limitations on changes in specified conditions in the Applicability when an LCO is not met. It precludes placing the Advanced NUHOMS[®] System in a specified condition stated in that Applicability (e.g., Applicability desired to be entered) when the following exist:

- a. Conditions are such that the requirements of the LCO would not be met in the Applicability desired to be entered; and
- b. Continued noncompliance with the LCO requirements, if the Applicability were entered, would result in the equipment being required to exit the Applicability desired to be entered to comply with the Required Actions.

Compliance with Required Actions that permit continued operation of the equipment for an unlimited period of time in specified condition provides an acceptable level of safety for continued operation. Therefore, in such cases, entry into a specified condition in the Applicability may be made in accordance with the provisions of the Required Actions. The provisions of this Specification should not be interpreted as endorsing the failure to exercise the good practice of restoring systems or components before entering an associated specified condition in the Applicability.

The provisions of LCO 3.0.4 shall not prevent changes in specified conditions in the Applicability that are required to comply with ACTIONS. In addition,

the provisions of LCO 3.0.4 shall not prevent changes in specified conditions in the Applicability that are related to the unloading of a canister.

Exceptions to LCO 3.0.4 are stated in the individual Specifications.

Exceptions may apply to all the ACTIONS or to a specific Required Action of a Specification.

Surveillances do not have to be performed on the associated equipment out of service (or on variables outside the specified limits), as permitted by SR 3.0.1. Therefore, changing specified conditions while in an ACTIONS Condition, either in compliance with LCO 3.0.4 or where an exception to LCO 3.0.4 is stated, is not a violation of SR 3.0.1 or SR 3.0.4 for those Surveillances that do not have to be performed due to the associated out of service equipment.

LCO 3.0.5 LCO 3.0.5 establishes the allowance for restoring equipment to service under administrative controls when it has been removed from service or not in service in compliance with ACTIONS. The sole purpose of this Specification is to provide an exception to LCO 3.0.2 (e.g., to not comply with the applicable Required Action(s)) to allow the performance of required testing to demonstrate:

- a. The equipment being returned to service meets the LCO; or
- b. Other equipment meets the applicable LCOs.

The administrative controls ensure the time the equipment is returned to service in conflict with the requirements of the ACTIONS is limited to the time absolutely necessary to perform the allowed required testing. This Specification does not provide time to perform any other preventive or corrective maintenance.

LCO 3.0.6 This specification is not applicable to an Advanced NUHOMS[®] System. The placeholder is retained for consistency with the power reactor technical specifications.

LCO 3.0.7 This specification is not applicable to an Advanced NUHOMS[®] System. The placeholder is retained for consistency with the power reactor technical specifications.

B 3.0 SURVEILLANCE REQUIREMENT (SR) APPLICABILITY

BASES

SRs SR 3.0.1 through SR 3.0.4 establish the general requirements applicable to all Specifications in Sections 3.1 and 3.2 and apply at all times, unless otherwise stated.

SR 3.0.1 SR 3.0.1 establishes the requirement that SRs must be met during the specified conditions in the Applicability for which the requirements of the LCO apply, unless otherwise specified in the individual SRs. This Specification is to ensure that Surveillances are performed to verify systems and components, and that variables are within specified limits. Failure to meet a Surveillance within the specified Frequency, in accordance with SR 3.0.2, constitutes a failure to meet an LCO.

Systems and components are assumed to meet the LCO when the associated SRs have been met. Nothing in this Specification, however, is to be construed as implying that systems or components meet the associated LCO when:

- a. The systems or components are known to not meet the LCO, although still meeting the SRs; or
- b. The requirements of the Surveillance(s) are known to be not met between required Surveillance performances.

Surveillances do not have to be performed when the equipment is in a specified condition for which the requirements of the associated LCO are not applicable, unless otherwise specified.

Surveillances, including Surveillances invoked by Required Actions, do not have to be performed on equipment that has been determined to not meet the LCO because the ACTIONS define the remedial measures that apply. Surveillances have to be met and performed in accordance with SR 3.0.2, prior to returning equipment to service.

Upon completion of maintenance, appropriate post maintenance testing is required to declare equipment within its LCO. This includes ensuring applicable Surveillances are not failed and their most recent performance is in accordance with SR 3.0.2. Post maintenance testing may not be possible in the current specified conditions in the Applicability due to the necessary equipment parameters not having been established. In these situations, the equipment may be considered to meet the LCO provided testing has been satisfactorily completed to the extent possible and the equipment is not

otherwise believed to be incapable of performing its function. This will allow operation to proceed to a specified condition where other necessary post maintenance tests can be completed.

SR 3.0.2

SR 3.0.2 establishes the requirements for meeting the specified Frequency for Surveillances and any Required Action with a Completion Time that requires the periodic performance of the Required Action on a "once per..." interval.

SR 3.0.2 permits a 25% extension of the interval specified in the Frequency. This extension facilitates Surveillance scheduling and considers plant operating conditions that may not be suitable for conducting the Surveillance (e.g., transient conditions or other ongoing Surveillance or maintenance activities).

The 25% extension does not significantly degrade the reliability that results from performing the Surveillance at its specified Frequency. This is based on the recognition that the most probable result of any particular Surveillance being performed is the verification of conformance with the SRs. The exceptions to SR 3.0.2 are those Surveillances for which the 25% extension of the interval specified in the Frequency does not apply. These exceptions are stated in the individual Specifications. The requirements of regulations take precedence over the TS. Therefore, when a test interval is specified in the regulations, the test interval cannot be extended by the TS, and the SR includes a Note in the Frequency stating, "SR 3.0.2 is not applicable".

As stated in SR 3.0.2, the 25% extension also does not apply to the initial portion of a periodic Completion Time that requires performance on a "once per..." basis. The 25% extension applies to each performance after the initial performance. The initial performance of the Required Action, whether it is a particular Surveillance or some other remedial action, is considered a single action with a single Completion Time. One reason for not allowing the 25% extension to this Completion Time is that such an action usually verifies that no loss of function has occurred by checking the status of redundant or diverse components or accomplishes the function of the equipment in an alternative manner.

The provisions of SR 3.0.2 are not intended to be used repeatedly merely as an operational convenience to extend Surveillance intervals (other than those consistent with refueling intervals) or periodic Completion Time intervals beyond those specified.

SR 3.0.3

SR 3.0.3 establishes the flexibility to defer declaring affected equipment as not meeting the LCO or an affected variable outside the specified limits when a Surveillance has not been completed within the specified Frequency. A delay period of up to 24 hours or up to the limit of the specified Frequency,

whichever is less, applies from the point in time that it is discovered that the Surveillance has not been performed in accordance with SR 3.0.2, and not at the time that the specified Frequency was not met.

This delay period provides adequate time to complete Surveillances that have been missed. This delay period permits the completion of a surveillance before complying with Required Actions or other remedial measures that might preclude completion of the Surveillance. The basis for this delay period includes consideration of unit conditions, adequate planning, availability of personnel, the time required to perform the Surveillance, the safety significance of the delay in completing the required Surveillance, and the recognition that the most probable result of any particular Surveillance being performed is the verification of conformance with the requirements.

When a Surveillance with a Frequency based not on time intervals, but upon specified unit conditions or operational situations, is discovered not to have been performed when specified, SR 3.0.3 allows the full delay period of 24 hours to perform the Surveillance.

SR 3.0.3 also provides a time limit for completion of Surveillances that become applicable as a consequence of changes in the specified conditions in the Applicability imposed by Required Actions.

Failure to comply with specified Frequencies for SRs is expected to be an infrequent occurrence. Use of the delay period established by SR 3.0.3 is a flexibility which is not intended to be used as an operational convenience to extend Surveillance intervals.

If a Surveillance is not completed within the allowed delay period, then the equipment is considered not in service or the variable is considered outside the specified limits and the Completion Times of the Required Actions for the applicable LCO Conditions begin immediately upon expiration of the delay period. If a Surveillance is failed within the delay period, then the equipment is not in service, or the variable is outside the specified limits and the Completion Times of the Required Actions for the applicable LCO Conditions begin immediately upon the failure of the Surveillance. Completion of the Surveillance within the delay period allowed by this Specification, or within the Completion Time of the ACTIONS, restores compliance with SR 3.0.1.

SR 3.0.4

SR 3.0.4 establishes the requirement that all applicable SRs must be met before entry into a specified condition in the Applicability.

This Specification ensures that system and component requirements and variable limits are met before entry in the Applicability for which these systems and components ensure safe operation of the facility.

The provisions of this Specification should not be interpreted as endorsing the failure to exercise the good practice of restoring systems or components to an appropriate status before entering an associated specified condition in the Applicability. However, in certain circumstances, failing to meet an SR will not result in SR 3.0.4 restricting a change in specified condition. When a system, subsystem, division, component, device, or variable is outside its specified limits, the associated SR(s) are not required to be performed, per SR 3.0.1, which states that Surveillances do not have to be performed on such equipment. When equipment does not meet the LCO, SR 3.0.4 does not apply to the associated SR(s) since the requirement for the SR(s) to be performed is removed. Therefore, failing to perform the Surveillance(s) within the specified Frequency does not result in an SR 3.0.4 restriction to changing specified conditions of the Applicability. However, since the LCO is not met in this instance, LCO 3.0.4 will govern any restrictions that may (or may not) apply to specified condition changes.

The provisions of SR 3.0.4 shall not prevent changes in specified conditions in the Applicability that are required to comply with ACTIONS. In addition, the provisions of SR 3.0.4 shall not prevent changes in specified conditions in the Applicability that are related to the unloading of a AHSM or 24PT1-DSC.

The precise requirements for performance of SRs are specified such that exceptions to SR 3.0.4 are not necessary. The specific time frames and conditions necessary for meeting the SRs are specified in the Frequency, in the Surveillance, or both. This allows performance of Surveillances when the prerequisite condition(s) specified in a Surveillance procedure require entry into the specified condition in the Applicability of the associated LCO prior to the performance or completion of a Surveillance. A Surveillance that could not be performed until after entering the LCO Applicability would have its Frequency specified such that it is not "due" until the specific conditions needed are met. Alternatively, the Surveillance may be stated in the form of a Note as not required (to be met or performed) until a particular event, condition, or time has been reached. Further discussion of the specific formats of SR annotation is found in Section 1.4, operation to proceed to a specified condition where other necessary post maintenance tests can be completed.

B 3.1 24PT1-DSC INTEGRITY

B 3.1.1 24PT1-DSC Vacuum Drying Time (Duration) and Pressure

BASES

BACKGROUND

A 24PT1-DSC is placed in the spent fuel pool and loaded with fuel assemblies meeting the requirements of the Functional and Operating Limits. A shield plug is then placed on the 24PT1-DSC. Subsequent operations involve moving the 24PT1-DSC to the decontamination area and removing water from the 24PT1-DSC. After the 24PT1-DSC inner top cover plate is secured, vacuum drying of the 24PT1-DSC is performed, and the 24PT1-DSC is backfilled with helium. During normal storage conditions, the fuel assemblies are stored in the 24PT1-DSC with an inert helium atmosphere, which is a better conductor than air or vacuum, which results in lower fuel clad temperatures and provides an inert atmosphere during storage conditions.

24PT1-DSC vacuum drying is utilized to remove residual moisture from the cavity after the 24PT1-DSC has been drained of water. Any water which was not drained from the 24PT1-DSC evaporates from fuel or basket surfaces due to the vacuum. This vacuum drying operation is aided by the temperature increase due to the heat generation of the fuel.

APPLICABLE SAFETY ANALYSIS

The confinement of radioactivity during the storage of spent fuel in a 24PT1-DSC is ensured by the use of multiple confinement barriers and systems. The barriers relied upon are the fuel pellet matrix, the metallic fuel cladding tubes in which the fuel pellets are contained, and the 24PT1-DSC in which the fuel assemblies are stored. Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. This protective environment is accomplished by removing water from the 24PT1-DSC and backfilling the 24PT1-DSC with an inert gas. The removal of water is necessary to prevent phase change-related pressure increase upon heatup. Time limits on vacuum drying >12 kW heat load are required for keeping the 24PT1-DSC materials under the ASME maximum temperature limits. This SAR evaluates and documents that the 24PT1-DSC confinement boundary is not compromised due to any normal, abnormal or accident condition postulated (SAR Chapter 3 and 11 structural analyses).

LCO

A stable vacuum pressure of < 3 torr further ensures that all liquid water has evaporated in the 24PT1-DSC cavity, and that the resulting inventory of oxidizing gases in the 24PT1-DSC is well below 0.25 volume % (two vacuum drying cycles from atmospheric pressure, 760 torr, to 3 torr will result in approximately $[3/760]^2 \times 100 < 0.002$ volume % of atmospheric, potentially oxidizing, gas).

APPLICABILITY

This is applicable to all 24PT1-DSCs.

ACTIONS

The actions specified require establishment of a helium pressure of at least 1 atmosphere within the time limits specified in the LCO for heat loads between 12 and 14 kW. The timeframe specified applies to the two vacuum drying operations and the helium backfill operations. If the required vacuum can not be established within the timeframe specified in the Condition column of the Actions table, a helium atmosphere (with a pressure of at least one atmosphere) is to be established within 24 hours or perform an assessment and implementation of corrective actions to return the 24PT1-DSC to an analyzed condition or reflood the DSC submerging all fuel assemblies. The 20 psig limit in the action section is based on the maximum allowed blowdown pressure.

SURVEILLANCE REQUIREMENTS

Ensure a minimum oxidizing gas content.

REFERENCES

SAR Chapter 3 and 4

B 3.1 24PT1-DSC INTEGRITY

B 3.1.2 24PT1-DSC Helium Backfill Pressure

BASES

BACKGROUND

A 24PT1-DSC is placed in the spent fuel pool and loaded with fuel assemblies meeting the requirements of the Functional and Operating Limits. A shield plug is then placed on the 24PT1-DSC. Subsequent operations involve moving the 24PT1-DSC to the decontamination area and removing water from the 24PT1-DSC. After the 24PT1-DSC inner top cover plate is welded, vacuum drying of the 24PT1-DSC is performed, and the 24PT1-DSC is backfilled with helium. During normal storage conditions, the 24PT1-DSC is backfilled with helium, which is a better conductor than air or vacuum, which results in lower fuel clad temperatures. The inert helium environment protects the fuel from potential oxidizing environments.

APPLICABLE SAFETY ANALYSIS

Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. SAR section 3.5 evaluates the effect of long term storage and short term temperature transients on fuel cladding integrity. Credit for the helium backfill pressure is taken to limit the potential for corrosion of the fuel cladding. SAR Chapter 4 evaluates the 24PT1-DSC maximum pressure under normal, off-normal, and accident conditions

LCO

24PT1-DSC backpressure is maintained within a range of pressure that will ensure maintenance of the helium backfill pressure over time and will not result in excessive 24PT1-DSC pressure in normal, off-normal and accident conditions.

APPLICABILITY

This specification is applicable to all 24PT1-DSCs.

ACTIONS

The actions required and associated completion times are associated with the time limits established in specification 3.1.2. The total time for vacuum drying and helium backfill is specified in specification 3.1.2 as a function of 24PT1-DSC heat load. These time limits are imposed to ensure that the 24PT1-DSC basket components will not exceed material temperatures for which ASME has specified maximum allowable stresses.

SURVEILLANCE REQUIREMENTS

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.

REFERENCES

SAR Chapters 3 and 4

B 3.1 24PT1-DSC INTEGRITY

B 3.1.3 24PT1-DSC Helium Leak Rate of Inner Top Cover Plate Weld and Vent /Siphon Port Cover Welds

BASES

BACKGROUND

A 24PT1-DSC is placed in the spent fuel pool and loaded with fuel assemblies meeting the requirements of the Functional and Operating Limits. A shield plug is then placed on the 24PT1-DSC. Subsequent operations involve moving the 24PT1-DSC to the decontamination area and removing water from the 24PT1-DSC. After the 24PT1-DSC inner top cover plate is secured, vacuum drying of the 24PT1-DSC is performed, and the 24PT1-DSC is backfilled with helium. Prior to completion of the 24PT1-DSC outer top cover plate welding, the helium leak rate is determined to ensure that the confinement boundary is leaktight, as required in the confinement analysis of SAR Chapter 7. The 24PT1-DSC shell and inner bottom cover plate confinement boundaries are confirmed to be leaktight during 24PT1-DSC fabrication.

APPLICABLE SAFETY ANALYSIS

The 24PT1-DSC confinement boundary is helium leak tested to confirm that it is leaktight in accordance with SAR Chapter 7 to preclude 24PT1-DSC leakage resulting in exposure to the public.

LCO

The confinement boundary is maintained leaktight to eliminate releases of radioactivity from the 24PT1-DSC to the environment during storage.

APPLICABILITY

This specification is applicable to the inner top cover plate and vent/siphon port cover welds of all 24PT1-DSCs.

ACTIONS

Should the helium leak rate not meet the requirements of this specification, the 24PT1-DSC must be returned to an analyzed condition or unloaded.

SURVEILLANCE REQUIREMENTS

To ensure that the 24PT1-DSC confinement boundary is leaktight and to retain helium cover gases within the 24PT1-DSC and prevent oxygen from entering the 24PT1-DSC.

REFERENCES

SAR Chapter 7