DRAFT Request for Supplemental Information
NAC International
Docket No. 71-9356
Model No. MAGNATRAN

1.0 GENERAL INFORMATION

1-1 Provide a table that clearly identifies the Transportable Storage Canister (TSC) and the allowable fuel assembly types for each.

It is unclear what assemblies are allowed in each type of TSC.

This information is needed to satisfy regulation 10 CFR 71.33(b).

1-2 Clarify the contents to be transported in the MAGNATRAN.

The acronyms used to describe the allowed fuel assemblies in Tables 1.3-6, 1.3-7, 1.3-19, and 1.3-20 are not well defined or consistent throughout the application.

This information is needed to satisfy the requirements of 10 CFR 71.33(b) which gives specific requirements for specifying the contents of the package.

1-3 Clarify if this system is being licensed for Pu shipments or to transport MOX? (SAR page 6.8.1-5)

SAR Section 1.3.3 has a special requirement for shipping Pu. It is noted that Chapter 6.0 references MOX fuel to cover actinides burnup credit for benchmarking purposes; however, this is not a comprehensive criticality safety evaluation for MOX fuel.

This information is needed to satisfy regulation 10 CFR 71.33(b), and 71.63.

2.0 STRUCTURAL AND MATERIALS EVALUATION

MATERIALS EVALUATION

2-1 Revise the SAR to add, and by reference in the proposed CoC, a plan to ensure, that for any TSC that has spent time in storage, that the contents and TSC itself meet all the requirements in the CoC. This plan should include inspections to obtain data, or analysis to support that the: 1) mechanical and thermal properties of the components of the TSCs related to safety, and 2) contents, have not degraded during the storage period. Provide evidence that removal of the TSC from the storage overpack will not damage the TSC, and impact safety.

All the mechanical and thermal properties of the materials of construction of the TSC used in this part 71 analysis are for pristine materials. Dry loaded (SAR page 7.1-4) canisters will have previously been in storage for some time and have been on a storage pad for a considerable number of years. The materials properties used for the evaluation of the safety systems and contents of the TSCs that have already been in storage service must be representative of the conditions at the time of transport, not at the time of the loading of the TSC. No evidence was presented to indicate that the thermal and mechanical properties of the TSCs, or contents have not degraded during storage and are still applicable to the transportation evaluation. No consideration has been given in the SAR to the potential damage that may occur to the TSC during its removal from the storage overpack.

This information is needed to meet any thermal, shielding, criticality or structural requirements of 10 CFR 71 where the materials properties are integral to the response of the system.

STRUCTURAL EVALUATION

2-2 Structural Capability of for Nonfuel Hardware

Page 1.1-6. For the nonfuel hardware contents cited, identify those with potential structural functions for maintaining the as analyzed geometry of a fuel assembly and its ancillaries for the criticality safety evaluation. Provide a structural evaluation of the hardware, including the rod cluster control assembly (RCCA), to demonstrate acceptable stress, stiffness, and stability capabilities for the cask free drops associated with normal conditions of transport (NCT) and hypothetical accident conditions (HAC).

It is understood by the staff that some hardware, such as RCCAs, may potentially be used to control reactivity of an under-burned fuel assembly in a loaded cask.

Structural capabilities for the nonfuel hardware must, therefore, be identified and evaluated to meet the 10 CFR Part 71 requirements, including 10 CFR 71.71(c)(7), and 71.73(c)(1).

2-3 Design, Modeling, and Qualification of Impact Limiters

1. Drawing 71160-531. Add sufficient details to the proprietary drawings on the impact limiter design to ensure that the use of balsa wood to aid in mitigating end impact effects can properly be modeled and accounted for in both the end- and corner-drop tests in the LS-DYNA cask response simulation analysis.

2. Section 2.12.2.3, Benchmarking of LS-DYNA Impact Limiter Analysis Methodology. Expand the sensitivity analyses, or parametric studies, to identify drop orientations for which maximum damages to the cask are expected by including also the slapdown drop effects associated with landing the balsa center section tip onto an unyielding surface. In the expanded sensitivity analyses, bounding conditions of zero coefficient of friction between the target and the impact limiter must also be considered or otherwise justified.

   The drop orientation parametric studies address the NAC-STC equivalent cask system geometry, which, without additional evaluation, are inconclusive for the MAGNATRAN in that the balsa center section may land on the target to introduce large rotational motion and corresponding secondary impact to the cask. Additional drop orientations must, therefore, be examined before concluding that decelerations associated with the side drop will govern the structural evaluation of the cask system.

The impact limiter capabilities must be evaluated to meet the requirements of 10 CFR 71.73.

3.0 THERMAL EVALUATION

3-1 Provide further details on the design and effectiveness of the fins that are used to aid heat transfer during NCT and HAC.

1. Further explanation of the fins, in terms of design and effectiveness, are needed in order to determine the adequacy in removing thermal energy from the package during NCT and HAC. Issues to address in the text include general fin layout and design; sketches would also be helpful.

2. What is the effect on package component temperatures if there is some loss of fin effectiveness due to breakage, fouling, etc.? This should be quantified in some way; heat exchangers, for example, use fin effectiveness and overall surface efficiency .

3. The need to check the conditions of the fins (the number attached to the package, confirm the adequacy of their attachment to the package, fouling conditions, etc.) should be explicitly stated in Chapter 7.

4. What is the effectiveness of the fins during hypothetical accident fire conditions, where temperatures can reach 1475°F. Page 1.3-3 indicates that the fins are constructed of aluminum, which has a melting point of 1220°F. Do the fins survive the fire intact? If not, their loss must be accounted for during the fire and post fire. Likewise, it is important to consider the eutectic temperatures of dissimilar materials in contact.

This information is needed to determine compliance with 10 CFR 71 (71.43, 71.71, 71.73).

3-2 Provide further explanation concerning the effect of the personnel barrier on thermal performance.

1. The thermal description should clearly state the effect of the personnel barrier, if any, on the analyses considered in Chapter 3 and 7 of the SAR. This may require additional analysis to determine the bounding condition.

2. The effect of the personnel barrier on natural convection (Rayleigh number, etc.) and the boundary conditions modeled should be mentioned. The relation to Document No. 71160-3045, if any, should be clarified.

3. Do Table 3.4-1 and Table 3.5-1, 3.5-2 include the effect of the personnel barrier?

4. Clarify the effect of the personnel barrier during HAC.

This information is needed to determine compliance with 10 CFR 71 (71.43, 71.71, 71.73).

3-3 Provide the two-dimensional and three-dimensional ANSYS and FLUENT computational models discussed in Chapter 3 and 7.

1. Some of the thermal models were provided as part of the initial application (Document No. 71660-3013, 3014, 3015, 3045). Provide the two-dimensional and three-dimensional ANSYS and FLUENT computational models (input and output files) described in Chapter 3 and 7, including the three ANSYS models described on page 3.4-4, the four ANSYS models described on page 3.4-10, the HAC models, the models that show the 41 hour time limit on page 7.1-5, the models that show the six hour time limit on page 7.2-3.

2. At the appropriate places in the SAR, provide references to the specific Documents (71660-3013, 3014, 3015, 3045) so that the staff can more easily relate the SAR discussion with the descriptions in the individual Documents.

3. Note that the .db ANSYS file provided in the documents did not work on staff workstations. Please check the version and resend. If available, please also provide the .wbpj, .agdb, .wbdp ANSYS files. Likewise, please send the .cas, .dat, and .msh FLUENT files for the CFD runs mentioned in the SAR and supporting documents. The flntgz2.cas file could not be opened on staff workstations.

This information is needed to determine compliance with 10 CFR 71 (71.43, 71.71, 71.73).

3-4 Quantify the uncertainty in the cladding temperatures of the analyses.

The uncertainty in cladding temperature during NCT and HAC should be provided considering that there is only a 26°F temperature difference between the computational value of 726°F and the 752°F storage temperature limit.

This information is needed to determine compliance with 10 CFR 71 (71.43, 71.71, 71.73).

3-5 Provide color temperature contour plots; black and white contour plots were included in Document No. 71160-3045.

Color temperature contour plots should be provided in Document No. 71160-3045.

This information is needed to determine compliance with 10 CFR 71 (71.43, 71.71, 71.73).

3-6 Clarify the maximum pressure within the cask during accident conditions.

Page 3.5-4 states that "TSC and cask pressures are determined for two accident scenarios, 100% fuel failure **OR** the maximum temperature accident." Maximum pressure within the cask under accident conditions should assume maximum temperature **AND** 100% fuel failure. The maximum pressure within the cask during accident conditions should be updated.

This information is needed to determine compliance with 10 CFR 71 (71.43, 71.71, 71.73).

3-7 Provide the maximum thermal stresses and interferences during HAC in order to ensure structural integrity.

Page 3.5-4 does not address thermal stresses. The maximum thermal stresses and interferences during HAC should be discussed to ensure structural integrity.

This information is needed to determine compliance with 10 CFR 71 (71.43, 71.71, 71.73).

5.0 SHIELDING EVALUATION

5-1 (See RSI 5-1 of Amendment 3 of the MAGNASTOR System Docket No. 72-1031, ML103060029) Provide technical bases or validation for using the SAS2H code to calculate the gamma and neutron source terms of the fuel with burnup up to 70 GWd/MTU.

The applicant requests that the allowable contents in the MAGNATRAN have a maximum burnup of 70 GWd/MTU. However, the SAS2H code of the SCALE 4.4 package used in the source term calculations has not been validated to 70 GWd/MTU. The statements in the NUREG/CR-6701 (Review of Technical Issues Related to Predicting Isotopic Compositions and Source Terms for High-Burnup LWR Fuel), "In this demonstration the sensitivity profiles were calculated for a generic LWR fuel assembly having an initial enrichment of 3.0-wt % 235U. The depletion calculations were performed using a nominal power of 35 MW/t and extended to a maximum burnup of 75 GWd/t. The results presented here are only intended as a demonstration to illustrate typical trends in the sensitivity coefficients for several important data parameters with burnup," which the applicant quoted in the SAR, do not appear to be appropriate for use as a basis for code validation. Review of the NUREG/CR-6701 indicates that the statements in Appendix A of NUREG/CR-6701 were for sensitivity study rather than for code validation. NUREG/CR-6701 also shows that the fuel sample with maximum burnup is 73 GWd/MTU was taken from a reconstituted fuel assembly and the value is for peak rod burnup. The corresponding fuel assembly burnup is about 60 GWd/MTU (peak burnup/pellet power peaking factor/rod peaking factor = 73/1.1/1.1 ≈ 60).

Staff consulted the technical staff at Oak Ridge National Laboratory, the developer of the code, on the validation issue of SAS2H. The answer is that SAS2H has never been validated to 70 GWd/MTU burnup. Statements made in NUREG/CR-6701 clearly indicate that the sample from H. B. Robinson was merely used for illustration of the sensitivity study. In addition, the staff does not find NUREG/CR-7012 and NUREG/CR-7013 (these documents were cited in response to RSI 5-1 for the MAGNASTOR Amendment 3 application, Docket No. 72-1031) provide an adequate basis for use in shielding applications for high burn-up fuel since these documents were written for use in burnup credit applications. These reports document the use of the TRITON code (versus SAS2H) and the nuclides important for burn up credit analyses are not the same as those used for shielding analyses.

The staff requests that the applicant provide a technical basis for using the SAS2H code for calculations of the source terms for the contents with burnup up to 70 GWd/MTU. An independent validation, including trend analysis, of the code versus fuel burnup may be an acceptable approach to resolve this concern.

This information is needed to verify that the applicant has satisfied the dose rate requirements in 10 CFR 71.47 and 10 CFR 71.51.

5-2 Provide additional information on the shielding analysis for GTCC.

The staff finds that the information in Section 5.8.11 of the SAR describing the shielding evaluation for GTCC waste is incomplete. The applicant should submit additional information including the same (and applicable) components as the spent fuel storage evaluations. This should include at a minimum a description and justification for material, geometry, energy spectra, and activity, as well as any methods used to generate the aforementioned. The applicant should include a description of and a justification for the differences between NCT and HAC. The location of the detectors for evaluating dose rates should be discussed and justified. Streaming paths should be identified and discussed.

This information is needed to meet the requirements of 10 CFR 71.31 which provides requirements for the contents of a package application.

5-3 Correct inconsistent information throughout SAR when referencing maximum burnup requested for BWR assemblies.

Table 1.3-19 indicates that the maximum burnup for BWR fuel assemblies is 45,000 MWd/MTU. Chapter 5 indicates that the maximum burnup for BWR fuel is 60 GWd/MTU (see pages 5.3-1, 5.8.2-3, 5.8.4-3, 5.8.5-2 and Tables 5.8.4-6, 5.8.8-5).

This information is needed to satisfy the requirements of 10 CFR 71.33(b) which gives specific requirements for specifying the contents of the package.

6.0 CRITICALITY EVALUATION

6-1 Provide the following detailed information on the benchmark analysis for the fuel depletion analysis code:

1. List of IDs of and isotopes included in each of the chemical assay samples used in the benchmarking analysis.
2. Method used in calculating the bias and bias uncertainty that were used to adjust the calculated cask k_{eff} with consideration that some of the chemical assay measurement data do not include all isotopes for which burnup credit are sought.
3. Technical basis and justification for the approach used to determine the biases and bias uncertainties of the depletion code.
4. Input files for the models for all chemical assay samples that were used in the code benchmark analysis.

The applicant takes burnup credit for some actinides in its criticality safety analysis for the MAGNATRAN PWR spent fuel transportation package. In Section 6.8.2.2 of the SAR, the applicant lists the chemical assay data used in the depletion code benchmarking analysis. However, a survey of the relevant publications indicates that some of the chemical assay data do not include measurements for all actinides for which burnup credit is sought. The applicant is requested to provide information as listed above and justification for the applicability of each of the measured data to the MAGNATRAN package safety analysis.

In addition, the SAR indicates that an approach not consistent with NUREG/CR-6811 was developed for calculating the bias and bias uncertainty of the depletion code. It is not clear (1) how the bias and bias uncertainty were calculated using the MCNP code (in reference to the proprietary information), and (2) why this approach is appropriate for a finite system like the MAGNATRAN. The applicant is requested to provide information on the rational and technical basis for the chosen approach.

This information is needed based on 10 CFR 71.35 and to enable the reviewer to confirm compliance with 10 CFR 71.55 and 71.59.

6-2 Provide information on how the MAGNATRAN and MAGASTOR licenses are to be reconciled in terms of using RCCA rods for suppression of reactivity in the PWR packages.

The Safety Analysis Report of the MAGNATRAN states: “PWR WE 15 fuel assemblies may be transported at a maximum fresh fuel enrichment of 3.8 wt % ^{235}U provided an Ag-In-Cd full-length RCCA is inserted into the fuel assembly.” It is not clear how the RCCA load requirement is to be reconciled with the MAGNASTOR loading pattern since the latter does not include any requirement for RCCA loadings for criticality safety control. The applicant is requested to provide information on how the MAGNATRAN and MAGASTOR licenses are to be aligned in terms of using RCCA rods for reactivity control in the PWR packages.

This information is needed based on 10 CFR 71.43 and to enable the reviewer to confirm compliance with 10 CFR 71.55 and 71.59.

6-3 Provide criticality safety analysis for the scenario that RCCA rods were to slide out of the fuel assemblies under Hypothetical Accident Conditions unless it can be demonstrated that such a scenario is not plausible.

The MAGNATRAN package design requires use of RCCAs as a means for reactivity control for certain fuel assembly loadings. Although spacers are said to be used in the spaces between the fuel assemblies and the top lid of the TSC, it is not clear if the top nozzle of the RCCAs will be able to withstand the impact of the 30-foot drop accident scenario. In that case, the control may slide out of the fuel assemblies. However, in the SAR, the scenario that the RCCA rods may slide out of the fuel assemblies under Hypothetical Accident Conditions is not considered in the criticality safety analysis of the package. The applicant is requested to provide criticality safety analysis for the scenario that RCCA rods were to slide out of the fuel assemblies under Hypothetical Accident Conditions unless it can be demonstrated that such a scenario is not plausible.

This information is needed based on 10 CFR 71.43 and to enable the reviewer to confirm compliance with 10 CFR 71.55 and 71.59.

6-4 Provide criticality safety analysis for the MAGNATRAN package with deformed fuel assemblies under Hypothetical Accident Conditions.

Previous studies of spent fuel transportation packages indicate that plastic deformation of fuel assemblies in the packages may occur under Hypothetical Accident Conditions for certain packaging designs. The Safety Analysis Report for the MAGNATRAN transportation package, however, does not provide criticality safety analysis for package with deformed fuel assemblies under Hypothetical Accident Conditions. Unless it can be demonstrated that plastic deformation of fuel assemblies in the package is not plausible, an analysis is needed to demonstrate that the MAGNATRAN package meets criticality safety requirements of 10 CFR 71.55. Given the fact that the RCCAs required for certain fuel assemblies in the cask create additional space between the cask lid and the fuel assemblies, a higher end drop force may incur and which in turn may result in higher plausibility of plastic deformation of the fuel assemblies in the cask. The applicant is requested to provide a criticality safety analysis to demonstrate that the package design meets the criticality safety requirements of 10 CFR 71.55 if the structural analysis cannot demonstrate plastic deformation is not plausible for fuel assemblies in the cask under Hypothetical Accident Conditions.

This information is needed based on 10 CFR 71.43 and to enable the reviewer to confirm compliance with 10 CFR 71.47, 71.55 and 71.59.

6-5 Provide information on misload analysis with consideration of the complicated zoned loading patterns of the MAGNATRAN fuel baskets.

The applicant provided misload analyses in the Safety Analysis Report of the MAGNATRAN and concluded that misload is not a credible event based on an EPRI study. However, review of the EPRI report indicates that the conclusion of the report was drawn not based on complete data of misload events. In addition, the EPRI report does not include consideration of the complex loading patterns as required in the MAGNATRAN license application. The applicant is requested to provide its own misload analysis based on the up-to-date misload events and specific data with consideration of the loading patterns of the fuel baskets to be transported by MAGNATRAN.

This information is needed based on 10 CFR 71.43 and to enable the reviewer to confirm compliance with 10 CFR 71.55 and 71.59.

6-6 Clarify the maximum burnup of the fuels to be shipped by MAGNATRAN.

The applicant indicates in Table 1.3-6 of the SAR that the maximum burnup of the fuels is 70 GWd/MTU. Page 6.8.2-1, however, indicates that the maximum burnup is 46.46 GWd/MTU. The maximum burnup for the spent fuel to be transported is not clear.

In addition, on pages 1.3-26 and 1.3-35, the applicant indicates that all fuels with burnup greater than 45 GWd/MTU must be placed in the damaged fuel cans, which are at the four corner locations of the fuel basket. This loading pattern could create a challenge to the shielding design. Although Chapter 5 of the SAR presents some information on dose rate calculations, it was not clear what loading pattern was used in the dose rate calculation for the baskets having the damaged fuel can loaded with high burnup fuels.

This information is needed based on 10 CFR 71.43 and to enable the reviewer to confirm compliance with 10 CFR 71.47, 71.55 and 71.59.

7.0 OPERATING PROCEDURES EVALUATION

7-1 Add a more complete description for the drying process to the operating procedure in SAR Section 7.1.4 Step 11.

Currently SAR Section 7.1.4 step 11 states; “Vacuum dry the TSC and verify dryness.” Since there can be direct transfer of a TSC from the pool to the overpack (SAR Section 7.1.4 Step 17), this is insufficient. Steps including isolation of the pump, and criteria such as hold times and pressures should be included.

This information is needed to satisfy regulation 10 CFR 71.43(d).

8.0 ACCEPTANCE TESTS AND MAINTENANCE EVALUATION

8-1 Additional details of the thermal acceptance test must be provided in order to determine the effectiveness of the test.

1. There should be additional discussion of the thermal acceptance test provided on pages 8.1-24 through 8.1-26. It is unclear how the results can be used for acceptance, especially the concept of heat rejection capability by measuring condensate flow rate. In addition, provide mass and thermal energy balances to validate the concept.

2. Discuss the test implementation: where the steam enters, where the steam exits, where/how the condensate is collected, specifically where are the thermocouples located and which temperature gradients are to be measured.

3. There should be a corresponding numerical thermal analysis of the proposed test conditions (i.e., no insolation, ambient temperature, steam entering in/out) provided in Chapter 3 in order to determine the appropriateness of the measured temperature and temperature gradients.

4. Is this test to be performed at time intervals throughout the package lifetime in order to confirm the continued effectiveness of the packaging (i.e., gap dimensions remain, etc.)?

This information is needed to determine compliance with 10 CFR 71 (71.43, 71.71, 71.73).

OBSERVATIONS

1.0 GENERAL INFORMATION

1-1 Provide non-proprietary versions of all drawings.

The drawings in the non-proprietary version and proprietary version of the SAR do not match. The proprietary version contains drawings 71160-531 and 71160-618. The non-proprietary version does not list or contain these drawings in Section 1.4.3.

2.0 STRUCTURAL AND MATERIALS EVALUATION

MATERIALS EVALUATION

2-1 Provide precise references (document, page) on all the tables for materials properties. In the case of obscure references, copies of the applicable pages of the reference should be submitted with the SAR.

Currently there are no references on any of the tables for the sources of the material properties. References are only given at the end of the Chapter.

STRUCTURAL EVALUATION

2-2 Design, Modeling, and Qualification of Impact Limiters

1. Section 2.6.7.5, Impact Limiter. Provide sufficient physical attribute details, including wood block grain orientation and associated gusset partitioning, if any, for the impact limiter balsa sleeve and center sections. It is unclear how the two large pieces of balsa wood center and sleeve sections can be produced and assembled without sufficient drawing details, including gusset partitioning. Sufficient design details are needed to ensure proper implementation of a LS-DYNA impact limiter finite element model in calculating free drop cask response.

2. Section 2.6.7.5.1, Impact Limiter Evaluation. For the eight HAC drops, conditions cold and hot included, provide bounding hard copy LS-DYNA impact limiter part deformation plots, with sufficient annotations, to delineate the crush depths corresponding to those reported in Table 2.6.7-38.

   The reported crush depths suggest various degrees of material lock ups of the wood impact limiter. This information is needed to facilitate staff review of the benchmarking and performance of the impact limiter finite element model.

3. Table 2.6.7-38. For the same 30-ft HAC oblique drop, explain why a larger crush depth is calculated for the condition cold than for the hot. Explain also the seemingly inconsistent acceleration values, which are considered for selecting the baseline decelerations for evaluating the cask system and components.

2-3 Stress Acceptance Criteria for the Closure Lid Bolt Subject to Secondary Impact

Table 2.1.2-2, Allowable Stress Limits for Containment Structures. Revise the table by adding stress allowable for the closure lid bolts. Provide justification for considering only the maximum axial stress for the bolts subject to the end-drop secondary impact, as evaluated in Section 2.6.7.6.2 and 2.7.1.7.2 for the NCT and HAC cask free end drops, respectively.

It's unclear why the bolts are not evaluated also for other stress performance criteria, including the primary membrane-plus-bending category at the periphery of the bolt cross section resulting from prying action produced by deformation of the connected parts, per ASME, Section III, Appendix F, Section F-1335.1.

2-4 Factor of Safety for PWR Basket Geometric Instability

Section 2.7.13.1, PWR Basket Stability. Re-evaluate geometric instability potential of the PWR basket for an acceptable factor of safety, per the ASME Code Section III, Appendix F, Section F-1341.4 provisions. For the design weight multiplier selection, as described in the top paragraph of Page 2.7.13.1-5, the basket weight must also be considered in addition to the fuel assemblies.

The collapse load analysis as called out, per Section F-1341.3, applies to the load determined by a "limit analysis" rather than the kinematically strain hardening analysis considered in the application. The staff considers the Section F-1341.4 provisions acceptable for which the applied load shall not exceed 0.7 P_l, in determining the minimum factor of safety for the basket geometric instability evaluation.

2-5 Figures 2.6.13-3 and 2.6.13-4. Explain why two different element discretization schemes are used for the "pin" in analyzing the same PWR baskets but for different drop orientations.

2-6 Table 2.6.14-9. Verify that the maximum stresses are correctly reported for fuel tubes.

Tube No. 12 for which all maximum stresses are reported is not delineated in Figure 2.6.14-4 for the 45^o side drop basket orientation.

3.0 THERMAL EVALUATION

3-1 It is stated that some portions of the outer package, such as the fins, are made of aluminum. Confirm that the aluminum will not reach an ignition temperature.

3-2 It does not appear that the allowable pressure of the containment boundary is explicitly mentioned in Chapter 3, such as in Table 3.4-3; this information should be provided.

3-3 Page 3.5-2 states that the NS-4-FR neutron shield does not withstand the fire and is replaced with air during the post fire analysis. Does the material reach a temperature where it no longer acts as a barrier during the fire? If so, the air void should replace the shield before the 30 minute fire ends; this would be more conservative during the fire.

3-4 The allowable temperatures for the components should be listed in Table 3.5-1 and Table 3.5-2; the blanks in the tables should be filled with appropriate values.

3-5 Document 71160-3014 mentions a transport cask that is not MAGNATRAN. Confirm that the analyses are in fact for MAGNATRAN.

4.0 CONTAINMENT EVALUATION

4-1 Page 4-1 states that "No normal condition of transport or hypothetical accident condition results in releases of the TSC contents into the cask cavity or releases from the MAGNATRAN cask containment boundary into the atmosphere." Similar statements are made on Page 4.2-1 and 4.3-1. Considering the potential for long term storage, the basis for concluding that TSC contents cannot be released into the MAGNATRAN cask during NCT and HAC should be provided.

5.0 SHIELDING EVALUATION

5-1 The staff finds that more justification and possibly a CoC condition for verifying the peaking factors and the burnup profiles for the shielding analysis are required. The staff does not find adequate justification that those used for PWR and BWR fuel are bounding for all fuel assemblies that are to be transported in the MAGNATRAN. In its review of MAGNASTOR (Docket No. 72-1031, Reference Staff's SER on MAGNASTOR Rev. 0, ML090350589) the staff discusses that the use of 1.08 for PWR fuel is not consistent with the guidance in NUREG/CR-6801.

5-2 (See Observation 1 of Amendment 3 of the MAGNASTOR System Docket No. 72-1031, ML103060029) The source spectra for gamma and neutron source terms for the shielding analysis for high burnup fuels were not included in the SAR. In general, the source spectra are necessary information for the staff to determine if the application meets the regulatory requirements of the cask shielding design. This information is missing in the SAR.

5-3 The staff finds that the description of the damaged fuel evaluations for the shielding analysis is not clear. The SAR states that there are two modeling strategies for damaged fuel. Presumably the one that produces higher dose rates is used in the dose rate calculations, but the staff did not see this explicitly stated. In addition, the staff is not clear on the modeling of the damaged fuel within the MCNP shielding calculation.

8.0 ACCEPTANCE TESTS AND MAINTENANCE EVALUATION

8-1 There is only 36°F margin between neutron shield temperature and its allowable temperature. Considering that the neutron shield is made of polymer, which can degrade over time due to radiation and temperature, confirm that the NS-4-FR shield will retain its thermal properties throughout the package lifetime. Periodic acceptance tests may have to be performed to confirm consistent thermal properties.