September 2013

Revision 13C

MAGNASTOR®

(Modular Advanced Generation Nuclear All-purpose STORage)

FINAL SAFETY ANALYSIS REPORT

Amendment 4 Application Supplement

NON-PROPRIETARY VERSION

Docket No. 72-1031

NAC INTERNATIONAL

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September 19, 2013

U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738

Attn: Document Control Desk

Subject: Submission of a Request to Amend the U.S. Nuclear Regulatory Commission Certificate of Compliance No. 1031 for the NAC International MAGNASTOR® Cask System

Docket No. 72-1031

References:
1. U.S. Nuclear Regulatory Commission (NRC) Certificate of Compliance (CoC) No. 1031 for the NAC International MAGNASTOR Cask System, Amendment No. 2, January 30, 2012
2. MAGNASTOR Cask System Final Safety Analysis Report (FSAR), Revision 4, NAC International, February 2013
3. ED20130052, Submission of a Request to Amend the U.S. Nuclear Regulatory Commission Certificate of Compliance No. 1031 for the NAC International MAGNASTOR Cask System, NAC International, June 18, 2013
4. Application for Amendment to materials Certificate of Compliance No. 1031, Docket No. 72-1031 – Supplemental Information Needed, US Nuclear Regulatory Commission, August 8, 2013
5. ED20130130, Submission of NAC's Response to the US NRC RSI for NAC's Request to Amend CoC No. 1031 for the NAC MAGNASTOR Cask System, NAC International, September 6, 2013

NAC International (NAC) hereby submits a supplement to Reference 3 based on a public/closed meeting with the NRC Staff on September 9, 2013 where References 4 and 5 were discussed. This supplement modifies the request to amend Reference 1, described in Reference 3, as follows:

Revise LCO 3.1.1, Section 1, first table "PWR TSC Transfer with Reduced Helium Backfill Time" as follows:

- Row 1, 4th column, change from "No limit" to "600"

The resulting first table in LCO 3.1.1 will read as follows:

PWR TSC Transfer with Reduced Helium Backfill Time

Heat Load (kW)	Vacuum Time Limit (hours)	Helium Backfill Time (hours)	TSC Transfer Time (hours)
≤20	No limit	0	600
≤25	50	7	70.5
≤30	19	7	8
≤35.5	15	7	8

The 600-hour transfer time limit for the ≤20 kW heat load PWR TSC in this supplement to Reference 3 is bounded by the thermal analyses demonstrating that the time for transferring the helium backfilled TSC into the concrete cask is unlimited (See Page 4.4-33, Revision 13C of the MAGNASTOR FSAR). This request is also substantiated by the NRC approved and licensee implemented transfer time limits contained in the NAC UMS Storage System (72-1015) and the NAC-MPC Storage System (72-1025) Technical Specifications (LCO 3.1.4 in CoC 1015 Amendment 5, and CoC 1025 Amendment 6, respectively).

The analyses contained in the supporting NAC proprietary calculations submitted via Reference 5 demonstrating acceptability of unlimited TSC transfer time for the ≤20 kW heat load PWR TSC envelop the 600-hour TSC transfer time requested in this supplement.

Enclosed in this submittal package are the Revision 13C changed pages to Reference 2, as modified by Reference 3, that support revising Reference 1. This submittal includes one proprietary and one nonproprietary version of this submittal package. Attached to this letter is a signed affidavit requesting the included proprietary information be withheld from public disclosure via 10 CFR 2.390.

Consistent with NAC administrative practice, this proposed FSAR revision is numbered to uniquely identify the applicable changed pages. Revision bars mark the FSAR text changes on the Revision 13C pages. The included List of Effective Pages identifies the revision level of all pages in the Reference 2 FSAR with Revision 13A and 13C incorporated.

In order to better facilitate the review process, NAC is providing the Revision 13C change pages with appropriate backing pages. In accordance with NAC's administrative practices, upon final acceptance of this application, the 13A and 13C changed pages will be reformatted and incorporated into the next revision of the MAGNASTOR FSAR.

The MAGNASTOR CoC Amendment 3 final rule effective date postdates Reference 3. None of the changes requested in Reference 3 and in this supplement depends on Amendment 3.

Therefore, Reference 3, including this supplement, continues to be based on MAGNASTOR FSAR Revision 4 and CoC Amendment 2. The requested amendment is being referred to as CoC Amendment 4.

If you have any comments or questions, please contact me on my direct line at 678-328-1274.

Sincerely,

Anthony L. Patko
Director, Licensing
Engineering

Enclosures:
Enclosure 1 – List of Changes for MAGNASTOR Technical Specification, Amendment 4 Supplement
Enclosure 2 – List of Changes for MAGNASTOR FSAR, Revision 13C, Amendment 4 Supplement
Enclosure 3 – FSAR Changed Pages and LOEP, MAGNASTOR FSAR, Revision 13C, Amendment 4 Supplement

Craig K. Seaman (Affiant), Sr. Vice President, Engineering, Licensing, External Affairs of NAC International, hereinafter referred to as NAC, at 3930 East Jones Bridge Road, Norcross, Georgia 30092, being duly sworn, deposes and says that:

1. Affiant has reviewed the information described in Item 2 and is personally familiar with the trade secrets and privileged information contained therein, and is authorized to request its withholding.

2. The information to be withheld includes the following NAC Proprietary Information that is being provided to support the technical review of NAC's Request for an Amendment of Certificate of Compliance (CoC) (No. 1031) for the NAC International MAGNASTOR System.

   - Page 4.4-33 of MAGNASTOR FSAR, Revision 13C

   NAC is the owner of the information contained in the above documents. Thus, all of the above identified information is considered NAC Proprietary Information.

3. NAC makes this application for withholding of proprietary information based upon the exemption from disclosure set forth in: the Freedom of Information Act ("FOIA"); 5 USC Sec. 552(b)(4) and the Trade Secrets Act; 18 USC Sec. 1905; and NRC Regulations 10 CFR Part 9.17(a)(4), 2.390(a)(4), and 2.390(b)(1) for "trade secrets and commercial financial information obtained from a person, and privileged or confidential" (Exemption 4). The information for which exemption from disclosure is herein sought is all "confidential commercial information," and some portions may also qualify under the narrower definition of "trade secret," within the meanings assigned to those terms for purposes of FOIA Exemption 4.

4. Examples of categories of information that fit into the definition of proprietary information are:

   a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by competitors of NAC, without license from NAC, constitutes a competitive economic advantage over other companies.

   b. Information that, if used by a competitor, would reduce their expenditure of resources or improve their competitive position in the design, manufacture, shipment, installation, assurance of quality or licensing of a similar product.

   c. Information that reveals cost or price information, production capacities, budget levels or commercial strategies of NAC, its customers, or its suppliers.

   d. Information that reveals aspects of past, present or future NAC customer-funded development plans and programs of potential commercial value to NAC.

   e. Information that discloses patentable subject matter for which it may be desirable to obtain patent protection.

   The information that is sought to be withheld is considered to be proprietary for the reasons set forth in Items 4.a, 4.b, and 4.d.

5. The information to be withheld is being transmitted to the NRC in confidence.

6. The information sought to be withheld, including that compiled from many sources, is of a sort customarily held in confidence by NAC, and is, in fact, so held. This information has, to the best of my knowledge and belief, consistently been held in confidence by NAC. No public disclosure has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to the NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements, which provide for maintenance of the information in confidence. Its initial designation as proprietary information and the subsequent steps taken to prevent its unauthorized disclosure are as set forth in Items 7 and 8 following.

7. Initial approval of proprietary treatment of a document/information is made by the Vice President, Engineering, the Project Manager, the Licensing Specialist, or the Director, Licensing – the persons most likely to know the value and sensitivity of the information in relation to industry knowledge. Access to proprietary documents within NAC is limited via "controlled distribution" to individuals on a "need to know" basis. The procedure for external release of NAC proprietary documents typically requires the approval of the Project Manager based on a review of the documents for technical content, competitive effect and accuracy of the proprietary designation. Disclosures of proprietary documents outside of NAC are limited to regulatory agencies, customers and potential customers and their agents, suppliers, licensees and contractors with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

8. NAC has invested a significant amount of time and money in the research, development, engineering and analytical costs to develop the information that is sought to be withheld as proprietary. This information is considered to be proprietary because it contains detailed descriptions of analytical approaches, methodologies, technical data and/or evaluation results not available elsewhere. The precise value of the expertise required to develop the proprietary information is difficult to quantify, but it is clearly substantial.

9. Public disclosure of the information to be withheld is likely to cause substantial harm to the competitive position of NAC, as the owner of the information, and reduce or eliminate the availability of profit-making opportunities. The proprietary information is part of NAC's comprehensive spent fuel storage and transport technology base, and its commercial value extends beyond the original development cost to include the development of the expertise to determine and apply the appropriate evaluation process. The value of this proprietary information and the competitive advantage that it provides to NAC would be lost if the information were disclosed to the public. Making such information available to other parties, including competitors, without their having to make similar investments of time, labor and money would provide competitors with an unfair advantage and deprive NAC of the opportunity to seek an adequate return on its large investment.

NAC INTERNATIONAL

NAC INTERNATIONAL
AFFIDAVIT PURSUANT TO 10 CFR 2.390

STATE OF GEORGIA, COUNTY OF GWINNETT

Mr. Craig K. Seaman, being duly sworn, deposes and says:

That he has read the foregoing affidavit and the matters stated herein are true and correct to the best of his knowledge, information and belief.

Executed at Norcross, Georgia, this 19th day of September, 2013.

Craig K. Seaman
Sr. Vice President, Engineering, Licensing, External Affairs
NAC International

Subscribed and sworn before me this 19th day of September, 2013.

Deborah R Chapman
Notary Public

DEBORAH R CHAPMAN NOTARY PUBLIC GWINNETT COUNTY, GEORGIA MY COMMISSION EXPIRES 02-27-2017

Enclosure 1

Proposed Changes

for

MAGNASTOR® Technical Specifications, Amendment 4
(Docket No 72-1031)

NAC International

September 2013

List of Changes for the MAGNASTOR® Technical Specifications, Amendment 4

Revised LCO 3.1.1, Section 1, first table "PWR Drying with 8 Hours TSC Transfer" to the following:

1. Table title revised from "PWR Drying with 8 Hours TSC Transfer" to "PWR TSC Transfer with Reduced Helium Backfill Time"
2. Row 1, 4th column, revised from "8" to "600"
3. Row 2, 3rd column, revised from "0" to "7"
4. Row 2, 4th column, revised from "8" to "70.5"

PWR TSC Transfer with Reduced Helium Backfill Time

Heat Load (kW)	Vacuum Time Limit (hours)	Helium Backfill Time (hours)	TSC Transfer Time (hours)
≤ 20	No limit	0	600
≤ 25	50	7	70.5
≤ 30	19	7	8
≤ 35.5	15	7	8

Enclosure 2

List of Changes

for

MAGNASTOR® FSAR, Revision 13C
Amendment 4
(Docket No 72-1031)

NAC International

September 2013

List of Changes for the MAGNASTOR® FSAR, Revision 13C

Chapter/Page/ Figure/Table	Source of Change: Amendment 4	Description of Change
Note: The List of Effective Pages has been revised accordingly to reflect the list of changes detailed below. The Chapter Table of Contents, List of Figures and List of Tables are not affected by these changes.		
Chapter 1 – no changes		
Chapter 2 – no changes		
Chapter 3 – no changes		
Chapter 4		
Page 4.4-33	Amendment 4	Changed last sentence in new unnumbered subsection, "Maximum TSC Transfer Temperatures for PWR 20 kW (no additional cooling) and 25kW Heat Loads with 7 hours of cooling" to read "Additionally, the analyses demonstrate that …"
Chapter 5 – no changes		
Chapter 6 – no changes		
Chapter 7 – no changes		
Chapter 8 – no changes		
Chapter 9 – no changes		
Chapter 10 – no changes		
Chapter 11 – no changes		
Chapter 12 – no changes		
Chapter 13		
Page 13C-12	Amendment 4	Changed wording in first partial paragraph from "and unlimited TSC transfer time)." to "and 600-hour TSC transfer time)."
Chapter 14 – no changes		
Chapter 15 – no changes		

Enclosure 3

FSAR Changed Pages and LOEP

for

MAGNASTOR® FSAR, Revision 13C, Amendment 4 Supplement
(Docket No 72-1031)

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List of Effective Pages

List of Effective Pages (cont'd)

List of Effective Pages (cont'd)

List of Effective Pages (cont'd)

List of Effective Pages (cont'd)

Maximum TSC Transfer Temperatures for PWR 20 kW (no additional cooling) and 25kW Heat Loads with 7 hours of cooling

4.4.4 Maximum Internal Pressures for PWR and BWR TSCs

The maximum TSC internal operating pressures for normal conditions of storage are calculated in the following sections for the TSCs containing PWR and BWR design basis fuel assemblies.

Maximum Internal Pressure for the TSC Containing PWR Fuel

The internal pressure of a TSC containing PWR fuel assemblies is a function of fuel type, burnup, initial enrichment, cool time, fuel condition (failure fraction), presence or absence of nonfuel hardware, TSC length, and the backfill gases in the TSC. Gases included in the pressure evaluation of a TSC containing PWR fuel include fuel rod fission, decay, backfill gases and integral fuel burnable absorber (IFBA) generated gas, gas generated by the nonfuel hardware components (assembly control components contain boron as the absorber material), and TSC backfill gases. Each of the PWR fuel types is separately evaluated to determine a bounding pressure for a TSC containing PWR fuel assemblies.

Fission gases include all fuel material generated gases, including helium generated by long-term actinide decay. Based on detailed SAS2H calculations, the quantity of fission and decay gases rises as burnup and cool time are increased and enrichment is decreased. The maximum gas available for release is conservatively calculated based on 70,000 MWd/MTU burnup cases at an enrichment of 1.9 wt % ^{235}U and a cool time of 40 years for maximum fissile material assemblies in each major PWR fuel class. For other PWR fuel assembly types, fission and decay gases are determined by ratioing the fissile material mass to the maximum fissile material mass assemblies.

Fuel rod backfill pressure varies significantly among the PWR fuel types. Based on a literature review, a 500 psig backfill is assigned to Westinghouse and CE core fuel types. A maximum backfill pressure of 435 psig is assigned to B&W core assemblies. Backfill gas quantities are based on the fresh fuel free volume between the fuel pellet stack and the fuel rod cladding, including the plenum volume, and a backfill temperature of 68°F.

Burnable poison rod assemblies (BPRAs) placed within the TSC may contribute additional gas quantities due to n-alpha reaction of ^{10}B during in-core operation. A portion of the neutron poison population is formed by ^{10}B. Other neutron poisons, such as gadolinium and erbium, do not produce a significant amount of helium nuclides (alpha particles). The principal BPRAs in use include the Westinghouse Pyrex (borosilicate glass) and WABA (wet annular burnable absorber) configurations, as well as B&W BPRAs and shim rods used in CE cores. The CE shim rods replace standard fuel rods to form a complete assembly array. The quantity of helium available for release from the BPRAs is directly related to the initial boron content of the fuel

BASES (continued)

BACKGROUND (cont.)

inner port covers are then helium leak tested to verify the absence of helium leakage to a minimum sensitivity of 1.0×10^{-7} cm^3 / sec (helium). The outer port covers are then installed, welded and the final weld surface examined by dye penetrant methods.

The TSC weldment is designed, analyzed, and tested to meet the leaktight criteria of ANSI N14.5. In addition, the closure lid-to-TSC shell weld is hydrostatically pressure tested and examined by multi-pass dye penetrant examination following fuel loading. The closure lid, closure ring and inner and outer port covers provide redundant closures to ensure confinement boundary integrity. Therefore, leakage of radioactive materials from the TSC and loss of helium and possible in-leakage of air are not considered credible.

APPLICABLE SAFETY ANALYSIS

The confinement of the radioactive materials contents in the TSC is ensured by the multiple confinement boundaries, including the fuel pellet matrix, the fuel rod cladding, and the pressure boundary provided by the TSC. Long-term integrity of the spent fuel contents is ensured by the inert helium atmosphere of the TSC, which is accomplished by the removal of free water, elimination of residual oxidizing gases, and backfilling with a measured mass of high purity helium. The pressurized helium atmosphere in the TSC ensures that the MAGNASTOR SYSTEM convective heat transfer thermal design will perform as analyzed. The measurement of the helium backfill mass ensures that the TSC internal pressure does not exceed the TSC's design pressure under design storage operating conditions.

LCO

A dry pressurized, helium filled and sealed TSC establishes the inert environment that will ensure the integrity of the fuel cladding and proper performance of the MAGNASTOR SYSTEM thermal design, while precluding air in-leakage and out-leakage of radioactive materials.

The Section 1 Tables of the LCO specify the limits for both PWR and BWR SNF contents (based on the decay heat load of the TSC contents) for Maximum Vacuum Drying Times; Minimum Helium Backfill Time (i.e., minimum time period the TSC is allowed to soak with annulus cooling system in operation following completion of the helium mass backfill prior to the initiation of the TSC transfer to the CONCRETE CASK in the TRANSFER CASK); and the Maximum TSC Transfer Time available to complete the transfer of the TSC to the CONCRETE CASK.

The Section 2 Table in the LCO provides the Maximum Drying Time Limit for the second and subsequent vacuum drying cycles following a minimum of 24 hours of either in-pool cooling or annulus circulating water system (ACWS) cooling with the TSC backfilled to 75 psig (+10, -0) with high purity helium, if the TSC dryness criteria were not met on the first vacuum drying cycle (this Table is not applicable to PWR

(continued)

BASES (continued)

LCO (cont.)

contents with decay heat loads of ≤ 20 kW, which has unlimited vacuum drying time, no minimum helium backfill time and 600-hour TSC transfer time).

The second or fourth Table in Section 1 of LCO 3.1.1 (for maximum TSC transfer times) is also to be utilized following the additional drying cycles in accordance with Section 2 of LCO 3.1.1 to determine the Minimum Helium Backfill Time and Maximum TSC Transfer Time as Section 2 specifies a minimum in-pool or ACWS cooling period of 24 hours. Note that the helium backfill (soak) and transfer times in these Tables would also be applicable for a second cycle of TSC transfer to the CONCRETE CASK if the first transfer cycle was not completed in the allowed time. The minimum 24-hour helium soak would lower and reset the TSC and SNF content temperatures to a value corresponding to the temperatures used in the determination of the second and fourth Tables of Section 1 limits.

Each temperature transient, either resulting from additional water cooling and vacuum drying cycles, or from additional helium soak and TSC transfer cycles, would need to be accounted for in the 10 allowable thermal transients for SNF assemblies with burnups exceeding 45,000 MWd/MTU.

APPLICABILITY

The sealed TSC with a dry measured helium mass cavity atmosphere is required to be established prior to TRANSPORT OPERATIONS to ensure integrity of the fuel contents and the effectiveness of the heat dissipation capability during LOADING OPERATIONS and STORAGE OPERATIONS.

ACTIONS

A note has been added to the ACTIONS, which states that, for this LCO, separate Condition entry is allowed for each TSC. This is acceptable as the Required Actions for each Condition provide appropriate compensatory measures for each TSC not meeting the LCO. Subsequent TSCs that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If the cavity vacuum drying pressure with the vacuum pump isolated and turned off is not met prior to TRANSPORT OPERATIONS, an engineering evaluation is necessary to determine the potential quantity of moisture left in the TSC. Since moisture remaining in the cavity during TRANSPORT and STORAGE OPERATIONS may represent a long-term degradation issue, immediate action is not required. The Completion Time is sufficient to complete an engineering evaluation of the safety significance of the Condition.

(continued)