

March 8, 2007

Mr. B. K. Miles
Division of Naval Reactors
U.S. Department of Energy
Washington, DC 20858

SUBJECT: TERMINATION OF NRC REVIEW OF NAVAL REACTORS REQUEST FOR A SPECIAL PACKAGE AUTHORIZATION FOR THE S5W POWER UNIT SHIPPING CONTAINER (TAC NO. L24022)

Dear Mr. Miles:

By application dated May 16, 2005, as supplemented June 23, 2006, the U.S. Department of Energy's Division of Naval Reactors requested a Special Package Authorization for a one-time shipment of the S5W Power Unit Shipping Container, in accordance with the provisions of 10 CFR 71.41(d). Naval Reactors requested that a Special Package Authorization be issued to authorize a single shipment of the package beyond its expected expiration date of October 1, 2008. Due to the grandfathering provisions of 10 CFR 71.19, Certificate of Compliance (CoC) No. 5580 for the S5W Power Unit Shipping Container cannot be renewed and its use is not authorized after October 1, 2008.

The staff has reviewed the application, as supplemented, and, in consultation with the Office of the General Counsel, has determined that it cannot approve a Special Package Authorization for a one-time shipment of the S5W Power Unit Shipping Container after its expected expiration date of October 1, 2008, under the provisions of 10 CFR 71.41(d). Accordingly, the staff is terminating the review of the Special Package Authorization request.

The staff has determined that the provisions of 10 CFR 71.41(d) are only applicable to one-time shipments of large components that cannot be shipped inside a certified package, or for which designing a packaging that meets all the requirements of 10 CFR Part 71 would be impracticable. The staff's position, documented in the proposed and final rule for the last revision of 10 CFR Part 71 (69 FR 3698 and 67 FR 21390), states that the provisions of 10 CFR 71.41(d) will "apply only in limited circumstances and only to one-time shipments of large components." The rule states that the intent of 10 CFR 71.41(d) was to fill in a gap in NRC rules for very large components that "may contain significant quantities of radioactive material, but ... are so large that it may not be practical to fabricate authorized packagings for them" (69 FR 3743). A Special Package Authorization for a one-time shipment of the S5W Power Unit Shipping Container after its expiration date would not meet the criteria of a shipment of very large components that cannot be shipped inside a packaging, or for which it would be impracticable to design and fabricate an authorized packaging

The proposed one-time shipment would not meet the grandfathering provisions of 10 CFR 71.19(a)(3). These provisions state that authorization for use of a Type B()F package will expire on October 1, 2008. Use of the package beyond this date requires that the package meet the latest packaging standards of 10 CFR Part 71 (10 CFR 71.19(e)). Although the staff believes that, if performed prior to its expiration date, the proposed one-time shipment could be performed in compliance with the regulations and the conditions of the CoC, the staff cannot

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cite the provisions of 10 CFR 71.41(d) to approve the one-time shipment after its expiration date. The fact that it may be costly to update the package design and modify the package to meet present regulations is not, by itself, sufficient for a finding that compliance with the regulations is impracticable, as required by 10 CFR 71.41(d).

Notwithstanding the issues presented by this request, the staff performed a technical evaluation of the request for a one-time shipment of the S5W Power Unit Shipping Container after its expiration date. The purpose of the staff's technical evaluation was to determine whether the one-time shipment could be performed safely by providing a level of safety equivalent to that provided if all applicable regulations were met. The staff's findings are documented in the enclosed Safety Evaluation Report (SER).

If you have any additional questions regarding this matter, we would be pleased to meet with you and your staff. You may contact me or Mr. Jose R. Cuadrado of my staff at (301) 415-8500.

Sincerely,

/RA/

Robert A. Nelson, Chief
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-9318
TAC No. L24022

Enclosure: Safety Evaluation Report

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SAFETY EVALUATION REPORT

Evaluation of Naval Reactors Request for One-Time Shipment of the Model No. S5W Power Unit Shipping Container Certificate of Compliance No. 5580 Docket No. 71-9318

SUMMARY

By application dated May 16, 2005, as supplemented June 23, 2006, the U.S. Department of Energy's Division of Naval Reactors, requested a Special Package Authorization for use of the S5W Power Unit Shipping Container. In its application, Naval Reactors explained that due to the current grandfathering provisions in 10 CFR 71.19, Certificate of Compliance (CoC) No. 5580 for the S5W Power Unit Shipping Container may only be renewed up to October 1, 2008. Naval Reactors requested that a Special Package Authorization be issued to authorize a single shipment of the package beyond its expiration date of October 1, 2008.

Based on the statements and representations in the application, as supplemented, and the staff's review, the staff concludes that it cannot issue a Special Package Authorization for use of the S5W Power Unit Shipping Container for a one-time shipment after its expiration date. However, the staff performed a technical evaluation of the proposed shipment and found that, subject to additional conditions, the one-time shipment can provide a level of safety equivalent to that provided by the regulations in 10 CFR Part 71.

The staff notes that this Safety Evaluation Report (SER) does not constitute, in any part, NRC approval of Naval Reactors request for a one-time shipment. The purpose of this SER is to document NRC staff's findings and their technical bases.

PACKAGE DESCRIPTION

The S5W Power Unit Shipping Container is a container and support assembly designed to ship and store new naval reactor power units. The package is comprised essentially of three major assemblies: (1) the outer frame, (2) the inner frame, and (3) the shipping container. During shipment, the shipping container is bolted to the inner frame in a horizontal position. Two trunnions welded to the middle section of the shipping container support the lower end of the container and also provide the means whereby the container can be rotated from the horizontal (shipping) attitude to the vertical (loading-unloading) attitude in the inner frame. The inner frame and shipping container are supported by the outer frame and pedestal through 80 elastic shock mounts, each of which is secured to both the inner frame and outer frame.

The approximate dimensions of the three major assemblies of the package are: (1) outer frame: 121 inches width by 56 inches height by 236 inches length; (2) inner frame: 109 inches width by 52 inches height by 269 inches length; and (3) shipping container: 95 inches diameter by 234 inches. The maximum weight of the loaded package is approximately 127,900 lbs.

BACKGROUND

Package History

The S5W Power Unit Shipping Container was originally certified for use by the Atomic Energy Commission (AEC) under a special permit by the Department of Transportation. On February 20, 1974, the AEC issued the initial AEC Certificate of Compliance for the package, identified as AEC-NR US/5580/BF, Rev. 0. Based on this AEC certificate, NRC issued NRC CoC No. 5580, Rev. 0, for the S5W Power Unit Shipping Container on April 21, 1978. The current revision of the certificate, Revision 8, will expire on December 31, 2007. The package identification number is USA/5580/B()F.

Grandfathering Provisions

The latest revision of 10 CFR Part 71, which became effective on October 1, 2004 (69 FR 3698), incorporated, in part, the provisions in IAEA's Regulations for the Safe Transport of Radioactive Material, 1996 Edition (TS-R-1), related to the use of previously approved packages. These provisions, colloquially known as "grandfathering" provisions, allow packages approved under previous versions of the regulations to be used, provided they are properly maintained and no additional packages are fabricated.

The new grandfathering provisions of 10 CFR Part 71 specifically limit grandfathering of packages approved under the 1967 version of the IAEA regulations. NRC believes that packages approved under these standards lack the enhanced safety improvements that have been incorporated in packages approved under subsequent editions of the regulations. These improvements include a specified degree of leakage resistance and being subject to the quality assurance requirements of Subpart H of 10 CFR Part 71.

Nevertheless, in an effort to give users and certificate holders an opportunity to phase-out old packages and phase-in new ones, or demonstrate that these meet the current requirements, NRC implemented a 4-year phase-out period of 1967-approved packages that began on October 1, 2004, and will conclude on October 1, 2008.

Specifically, the provisions of 10 CFR 71.19(a) state that a package previously approved by NRC, and designated as Type B() or B()F, may be used under the general license provisions of 10 CFR 71.17, provided it meets certain additional requirements, such as requiring that no new packagings be fabricated, and that any package modifications be limited in scope. However, 10 CFR 71.19(a)(3) states that this provision will expire on October 1, 2008. Therefore, the use of Type B() and B()F packages is not authorized after this date, and all Type B() and B()F packages will be retired from use.

Special Package Authorization Request

As a result of the grandfathering provisions of 10 CFR 71.19, the applicant, by letter dated May 16, 2005, requested that a Special Package Authorization be approved by NRC to authorize a single shipment of the S5W Power Unit Shipping Container after the proposed expiration date of October 1, 2008, in accordance with 10 CFR 71.41(d). The shipment supports a final refueling need for DOE-Naval Reactors.

The provisions of 10 CFR 71.41(d) state that “packages for which compliance with the other provisions of these regulations [i.e., 10 CFR Part 71] is impracticable shall not be transported except under special package authorization.” The provision states that a special package authorization may be issued if the applicant demonstrates the following: (1) compliance with the other provisions of the regulations is impracticable, (2) requisite standards of safety established by the regulations are demonstrated through means alternate to the other provisions, and (3) the overall level of safety in transport for these shipments is at least equivalent to that which would be provided if all the applicable requirements had been met.

EVALUATION OF SPECIAL PACKAGE AUTHORIZATION REQUEST

In order to demonstrate that compliance with the other provisions of the regulations is impracticable, the applicant provided an estimate of the expected manpower and package modification costs required to update the package design and its Safety Analysis Report (SAR) to the latest standards in 10 CFR Part 71. The applicant identified two distinct issues that it would need to address to comply with the latest regulations.

The first issue identified by the applicant is the evaluation of brittle fracture and corrosion of the carbon steel fasteners. The applicant estimates that the effort needed to perform the evaluation and revise the SAR to include this information is approximately 2 man-months. If the evaluation requires replacement of these fasteners, the applicant estimates it would require an effort of 1 man-year of engineering analysis and a minimum of \$200,000 in material and labor costs.

The second issue identified by the applicant is the inclusion of additional analyses specified by current guidance in NUREG-1609 and the update of the remaining portions of the SAR that do not conform to the current format of Regulatory Guide 7.9. The applicant estimated that, at a minimum, these modifications would require approximately 2 man-years of effort.

Based on the information provided by the applicant and the staff’s evaluation of the applicable regulations, the staff concludes that it cannot issue a Special Package Authorization for use of the S5W Power Unit Shipping Container for a one-time shipment after its expiration date. The staff has concluded that the provisions of 10 CFR 71.41(d) are only applicable to one-time shipments of large components that cannot be shipped inside a certified package, or for which designing a packaging would be impracticable. This conclusion is consistent with the statements of consideration for the proposed and final rule for the last revision of 10 CFR Part 71 (69 FR 3698 and 67 FR 21390). These state that the provisions of 10 CFR 71.41(d) will “apply only in limited circumstances and only to one-time shipments of large components.” The intent of 10 CFR 71.41(d) was to fill a gap in NRC rules for very large components that “may contain significant quantities of radioactive material, but ... are so large that it may not be practical to fabricate authorized packagings for them” (69 FR 3743).

A Special Package Authorization for a one-time shipment of the S5W Power Unit Shipping Container after its expiration date would not meet the criteria of a shipment of very large components that cannot be shipped inside a packaging, or for which it would be impracticable to design and fabricate an authorized packaging. The staff finds that the shipment would not need any special package design features or alternative methods for demonstrating compliance with the regulations that the provisions of 10 CFR 71.41(d) requires.

The provision of the regulations that the proposed one-time shipment would not meet are the grandfathering provisions of 10 CFR 71.19(a)(3). These provisions state that authorization for use of a Type B()F package will expire on October 1, 2008. Use of the package beyond this date requires that the package meets the latest packaging standards of 10 CFR Part 71 (10 CFR 71.19(e)). Although the staff believes that, if performed prior to its expiration date, the proposed one-time shipment could be performed in compliance with the regulations and the conditions of the CoC, the staff cannot cite the provisions of 10 CFR 71.41(d) to approve the one-time shipment after its expiration date. The fact that it may be costly to update the package design and modify the package to meet present regulations is not, by itself, sufficient for a finding that compliance with the regulations is impracticable, as required by 10 CFR 71.41(d).

SAFETY EVALUATION OF PROPOSED ONE-TIME SHIPMENT

Although the staff cannot issue an approval for the one-time shipment under the provisions of 10 CFR 71.41(d), it has performed a technical evaluation of the proposed shipment to determine if the shipment could provide a level of safety equivalent to that provided if all the applicable regulations have been met.

To demonstrate that the one-time shipment could provide an equivalent level of safety, the staff's technical evaluation focused on making the following findings:

1. The applicant would ensure that the package continues to meet all the conditions of the last revision to CoC No. 5580 after its expiration, and until the one-time shipment is completed.
2. The applicant would evaluate the latest regulations in 10 CFR Part 71 and determine which new provisions the S5W Power Unit Shipping Container was not evaluated for when its initial CoC was issued. For those provisions that the package was not evaluated for, the certificate holder must show that the package already meets the specific provision or that it would implement special design features or operating controls during the shipment to compensate for not meeting these.

Evaluation of continued compliance with the conditions of the CoC

The issuance of a CoC for the S5W Power Unit Shipping Container certifies that the package, when used and operated according to the conditions stated in the CoC, meets the applicable safety standards set forth in 10 CFR Part 71. Therefore, performing the proposed one-time shipment in compliance with these conditions ensures that it will continue to provide a level of safety equivalent to that provided if all the applicable regulations are met. Accordingly, the applicant must ensure that the one-time shipment is performed in accordance with all the conditions of the last revision of CoC No. 5580 for the S5W Power Unit Shipping Container, regardless of its expiration date.

Although not included as a condition in the CoC, the staff notes that the applicant must perform the required maintenance and pre-shipment inspection procedures specified in the S5W Power Unit Shipping Container Technical Manual. The specific maintenance and inspection procedures are discussed in the application. The applicant must continue to perform these

procedures from the date of the package expiration until the completion of the one-time shipment. Continued performance of these procedures ensures that the one-time shipment provides a level of safety equivalent to that provided if all the applicable regulations are met.

Evaluation of applicable regulatory standards

To demonstrate compliance with the current regulatory standards, the applicant performed an evaluation of the current regulatory requirements in 10 CFR Part 71 and compared it with the package's current SAR to determine which provisions of the regulations the package design does not meet. A review of the SAR analyses and a comparison of these against 10 CFR Part 71 safety requirements showed that the only technical concern that was not addressed in the SAR is brittle fracture under low temperature conditions.

The applicant performed an evaluation of the applicability and potential impact of brittle fracture to the S5W Power Unit Shipping Container. The applicant discussed NRC's criteria on brittle fracture as discussed in Regulatory Guide 7.11. Based on an evaluation of these criteria, the applicant determined that the S5W Power Unit Shipping Container is a Category III container. Based on the requirements for Category III containers and the materials of construction of the S5W Power Unit Shipping Container, the applicant established that the highest nil-ductility temperature (NDT) for the container is -30°F. Therefore, in order to satisfy the NDT limits for a Category III container, the applicant established an operational control requiring that the package be shipped under ambient temperatures of 20°F or higher. The staff agrees with the applicant that the one-time shipment of the S5W Power Unit Shipping Container would need to be performed when ambient temperature is 20°F or higher.

In addition to the temperature controls, the applicant proposed that additional controls be imposed for the one-time shipment. These controls include speed controls and escort requirements. The requirements are discussed in the application.

The staff identified additional safety improvements included in the 1973 version of IAEA Safety Series No. 6, "Regulations for the Safe Transport of Radioactive Material," that are above those required in the 1967 version, under which the S5W Power Unit Shipping Container was approved. These safety improvements were included in NRC regulations in 10 CFR Part 71 and are discussed in [67 FR 21390](#). The specific improvements and a discussion of the applicability of each one follows:

- **Inclusion of A₁ and A₂ values** - The inclusion of specific A₁ and A₂ values for all radionuclides in the 1973 version of IAEA Safety Series No. 6 Regulations does not affect the ability of the S5W Power Unit Shipping Container to meet the current provisions of 10 CFR Part 71. The S5W Power Unit Shipping Container is a Type B package, and, based on its authorized contents, the required package standards it meets are the same as those required by the inclusion of these new A₁ and A₂ values. The inclusion of specific A₁ and A₂ values does not reduce the required package standards for a Type B package.
- **Containment system performance standards in terms A₁ and A₂ values** - Although the S5W Power Unit containment performance was not evaluated according to the standards adopted in the 1973 version of IAEA Safety Series No. 6, the physical

properties of the contents of the S5W Power Unit Shipping Container provide ample assurance that the package can meet the newer containment performance standards of 10 CFR Part 71.

- **Immersion test for Type A fissile material packages** - The 1973 version of IAEA Safety Series No. 6 introduced an immersion test requirement for Type A fissile material packages, which was only required for Type B packages under the previous version of the regulations. Since the S5W Power Unit Shipping Container is a Type B package, this immersion test requirement was analyzed during its approval, and does not introduce any additional requirements.
- **MNOP definition that excludes venting or active cooling systems** - The addition of a revised definition of the maximum normal operating pressure (MNOP) does not prevent the package from meeting the current provisions of 10 CFR Part 71. The S5W Power Unit Shipping Container holds new naval reactor power units, which are designed to withstand much higher pressures than the expected MNOP of the package.
- **Environmental Test Conditions** - The 1973 version of Safety Series No. 6 specified for the first time the high and low temperatures, pressures, and weights to be used when evaluating the package under normal and accident conditions tests. As discussed in the previous item, the contents of the S5W Power Unit Shipping Container are designed to withstand very high pressures, temperatures, and loads without any release of radioactivity.
- **Quality Assurance (QA) Requirements** - NRC regulations adopted QA requirements for the design, fabrication, and use of transportation packages before IAEA regulations did in the 1985 version of Safety Series No. 6. The staff has evaluated the proposed maintenance and pre-shipment inspection procedures and has determined that these are equivalent to those that would be required under a NRC-approved QA program. As discussed earlier, in order to ensure that the one-time shipment would meet an equivalent level of safety, the applicant must perform the maintenance and pre-shipment inspection procedures specified in the S5W Power Unit Shipping Container Technical Manual. Regarding the applicability of QA requirements to the design and fabrication of the package, the staff has determined that the applicant should ensure that the S5W Power Unit Shipping Container (PUSC) was designed and fabricated in accordance with a QA program that meets the requirements of Subpart H of 10 CFR Part 71. This demonstration ensures that the one-time shipment would provide an equivalent level of safety to those provided by meeting all applicable regulations.

Conditions for one-time shipment of the S5W Power Unit Shipping Container

As discussed above, the staff has determined that a one-time shipment of the S5W Power Unit Shipping Container after its expiration date would provide a level of safety equivalent to that provided if all applicable regulations are met, when subject to the following conditions:

1. The one-time shipment must be made in compliance with the conditions set forth in Certificate of Compliance (CoC) No. 5580 for the S5W Power Unit Shipping Container.

2. The applicant must continue to perform the package maintenance procedures outlined in the S5W PUSC Technical Manual until the one-time shipment is completed.
3. Prior to the one-time shipment, the applicant must perform the package pre-shipment inspection procedure outlined in the S5W PUSC Technical Manual.
4. Ambient temperatures throughout the duration of the one-time shipment must be greater than 20°F.
5. The maximum train speed during shipment must be 35 mph.
6. The shipment must be escorted and under constant 24-hour surveillance by Naval Nuclear Propulsion Program's (NNPP) escorts.

CONCLUSION

Based on the statements and representations provided by the applicant in the request dated May 16, 2005, as supplemented June 23, 2006, a review of the package's SAR and referenced documents in CoC No. 5580 for the S5W Power Unit Shipping Container, and for the reasons stated in this Safety Evaluation Report (SER), the staff has determined that, subject to the above stated conditions, the overall level of safety in transport provided by a one-time shipment of the S5W Power Unit Shipping Container would be at least equivalent to that which would be provided if all the applicable requirements of 10 CFR Part 71 had been met.

Issued on March 8, 2007.