

Adoption of TS-1-R, The Most Recent Challenge to Cask Certification

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ABSTRACT

Cask owners and the Department of Energy have invested considerable effort and resources toward certification of transportation casks for the broad variety of research reactor spent fuels. Adoption of the IAEA's latest cask safety recommendations, TS-1-R, by the U.S. Nuclear Regulatory Commission (NRC) presents a new challenge to cask owners wishing to continue their cask certifications at the highest possible level. The paper will present the efforts required by NAC International in certifying the NAC-LWT to TS-1-R and the interaction with NRC leading to the issuance of the new cask certificate.

BACKGROUND

It is US policy that its nuclear materials transportation regulations periodically be reviewed to "harmonize" them (achieve general compatibility) with IAEA transportation standards. While, with respect to international transportation of nuclear materials, the US Department of Transportation is the US Competent Authority, the Nuclear Regulatory Commission (NRC) acts as technical advisor for nuclear safety and security issues. From a practical standpoint, it is the NRC that conducts the most intensive reviews, directs the public participation process, and establishes the ultimate degree of conformity of the US Code of Regulations, Title 10, Part 71 - Packaging And Transportation Of Radioactive Material – with the IAEA standards.

In September 1999, the NRC undertook rulemaking to make 10CFR71 compatible with IAEA ST-1 which had been published by IAEA in 1996. Shortly thereafter in June 2000, the IAEA revised ST-1 and changed its designation to TS-R-1, which NRC then addressed in its reviews. In providing direction to the NRC staff, the Commission (NRC governing body) directed that an enhanced public participation process be utilized in the rulemaking. NRC released a document "Rulemaking Process for Revising 10 CFR Part 71 for Compatibility with IAEA Transportation

Safety Standards (ST-1), and to Make Other Changes" on May 30, 2000, to solicit early public input. The document provided an issue paper that summarized the changes being considered in 10CFR71. NRC decided to publish the Part 71 issue paper for public comment and initiated the enhanced public-participation process. A roundtable workshop was held on August 10, 2000, at the NRC Headquarters, and two town hall meetings, one of September 20, 2000, in Atlanta, GA, and one September 26, 2000, in Oakland, CA were held. Attendees included affected Federal agencies (DOE and DOT), public representatives (members of the public, environmental and public interest groups) representatives of the States (state congressmen and the Western Governor's Association), and representatives of industry (the Nuclear Energy Institute, representatives of the radioactive material shipping industry, the oil and gas industry, and the mineral industry.) The public comment period on the issues paper closed on September 30, 2000, with a total of 48 written comments having been received.

The NRC staff utilized this input to develop the proposed revision to 10CFR71 and presented it to the Commission on March 2, 2001. The presentation categorized the potential changes to 10CFR71 in the form of 19 different issues, 11 developed as a result to the compatibility review with TS-R-1, and 8 developed internal to NRC. Of the 11 compatibility issues, NRC proposed to adopt 9 as changes to 10CFR71. Of the 8 internally generated issues, 6 were identified for incorporation in the revised rulemaking. NRC's schedule for revision to 10CFR71 called for publishing the draft rule in the US Government Federal Register (which occurred in April 2001), a new 90 day public comment period, and then a year for the NRC staff to prepare the final rule for Commission action. This process continues today, with the formal release of the revised 10CFR71 yet to occur.

PROPOSED NRC ACTION

Eleven issues of compatibility with TS-R-1 were identified by NRC. The two that NRC proposed not to incorporate were exclusive use of the International System of units and Type C packaging requirements. NRC encourages use of SI units but is not inclined to make them mandatory, judging that no clear public health and safety benefit would result. This is generally consistent with US policy on use of SI units in other technical and commercial fields. NRC has proposed deferring action on the adoption of Type C packaging requirements on the basis that few air shipments of materials subject to the Type C criteria are likely, and that separate criteria for air transport of Plutonium were available. NRC wished further experience with the IAEA non-fissile package criteria before deciding on application to domestic commerce.

Eight issues not traceable to TS-R-1 were also considered for incorporation, although several of them have a relationship to the TS-R-1 requirements. After considering NRC policy on risk informed regulation and the input received during the public participation process, NRC proposed incorporation of 6 of the 8 changes. One, dealing with change authority for limited scope package modifications was proposed for application to dual purpose casks such as those used for dry storage at nuclear utilities, but not for single purpose transportation packages. Adoption of the ASME Code for package fabrication and modification of contamination limits applied to spent fuel and high level waste packages were not proposed for incorporation. NRC concluded that the ASME Code requirements to be applied to nuclear packaging have a reasonable chance of revision during the next few years resulting in unwarranted cost to package

designers and licensees. The concluded that modifying (relaxing) the contamination limits applied to spent fuel and high level waste packaging was not requested by either the transportation service providers or licensees and would result in an inconsistency with international regulations.

IMPACT ASSESSMENT

NAC has evaluated the potential changes to 10CFR71 to determine the likely impact on the fleet of NAC-LWT casks. NAC's policy is to upgrade its cask certifications to the most current standards whenever possible. Because final action on the regulation is not completed, the impact assessment has considered both the issues recommended for incorporation and those omitted.

Many of the criteria are have no direct applicability to the certification of the NAC-LWT cask fleet. These include IAEA Issue 2, Radioactive Exemption Values, Issue 3, Revision of A1 and A2, Issue 4, Uranium Hexafluoride Package Requirements, Issue 7, Deep Immersion Test (already applied to spent nuclear fuel packages), Issue 9, Changes to Definitions, and Issue 10, Crush test for Fissile Material Packages (imposed on light-weight packages only.)

Issue 1, Exclusive Use of SI Units, is not proposed for adoption at present. Were this to change, considerable review and revision to the NAC-LWT safety analysis report would be required. This has no impact on the package but would have both a time and financial impact on NAC's intended submission to NRC to upgrade the casks to a (-96) designation.

Issue 5, Introduction of Criticality Safety Index Requirements, has no significant impact on the certification or package use since it is determined I the same manner as the current criticality component of the Transportation Index. Further, it has no significant impact on packages shipped exclusive use which is currently the case for spent nuclear fuel shipments.

Issue 6, Type C Packages and Low Dispersible Material, is also not proposed for adoption at present. The NAC-LWT has, on occasion, been used for air transport of spent nuclear fuel when the danger imposed by surface shipment was deemed unacceptable. All involved the cask's use in international transport so adoption or deferral by NRC is unlikely to have any effect on U.S. usage. In NAC's judgment, it is likely that emergency shipments in the NAC-LWT will remain a possibility but will have to be approved on an exception basis and with no doubt a more intensive review. Issue 11, Fissile Material Package Design for Transport by Aircraft affects the criticality analysis of the package but is deferred due to the proposed NRC position of Type C packages.

Of the 8 NRC developed issues, Issue 12, special package Authorizations, Issue 13, Expansion of Part 71 Quality Assurance Requirements to Certificate of Compliance holders (NAC already maintains an NRC approved QA program), and Issue 19, Modification of Event Reporting Requirements, have no impact on the cask certificate or usage. Issue 14, Adoption of ASME Code to package design and fabrication is not proposed for adoption. However, should the ultimate 10CFR71 revision include this requirement, the impact could be significant, depending on the exact manner of implementation. While demonstrating that the design and fabrication of an existing package meets the general intent of code requirements may be possible, verbatim

compliance could be problematic. Issue 16, Fissile Material Exemptions, reduces the level of exempted material and provide additional criticality controls. Since all of the spent fuel shipments contemplated in the program are not affected by this provision, no impact is associated with its adoption.

Issue 15, Change Authority, is proposed for adoption only to dual purpose casks. Were it to be applied to transportation casks as well, it would allow for minor changes to be made by authority of the licensee without NRC approval. This could streamline minor approvals and reduce the costs of relatively insignificant certificate changes. The NRC proposed approach will maintain the current posture where all changes, no matter how trivial, are required to be submitted and approved by NRC. This represents no increase in the complexity of spent fuel transport but neither does it offer any simplification.

Issue 17, Double Containment of Plutonium, has been the basis for requiring highly engineered sealed inner containers for failed, segmented or declad rods. In the field, the containers must be drained and leak tested to meet the double containment criteria. NRC is proposing to delete this requirement based on a citizen petition submitted to the Commission. NRC has concluded that the requirement was not risk based, and that there is no comparable provision in the IAEA standards. Thus its deletion will bring U.S. regulations more closely into alignment with the international standards. From a practical standpoint, defective rods and assemblies will still be shipped in some form of “overpack” to limit spread of containment, facilitate retrieval of material, and simplify criticality analysis. However, this can be met with a container of much greater simplicity that those meeting the double containment standard, and require far less complicated operator interaction during loading. These are significant benefits which would be lost if NRC’s proposal were to be reversed and the double containment provision retained on final issuance.

Issue 18, Contamination Limits as Applied to Spent Fuel Packages, considered relaxing the specific limits using a risk based justification. This was considered as a result of package contamination events in Europe. NRC has recommended that the relaxation not be approved, mainly because none of the packaging and transportation providers requested it. The NAC-LWT has not experienced the contamination problems that other casks have, in part due to the absence of fins and crevices and due to its electro-polished surfaces.

CONCLUSION

The revision of 10CFR71 to “harmonize” the U.S. regulation with international standards will have little impact on the NAC-LWT. The revisions proposed by NRC should allow NAC to quickly apply for, and receive recertification of the cask as B(U)-96. However, the process utilized in the United States to achieve regulatory amendment has been time consuming and protracted. The greatest impact on NAC is likely not to be through changes to the NAC-LWT hardware or supporting analysis but simply the effort associated with the multiple reviews and comment periods. As IAEA switches to an increased frequency in review and amendment of their packaging standards, it is difficult to see how the U.S. regulatory process can keep pace without significant simplification.