

**THE GERMAN REGULATORY CONCEPT OF TRANSPORT PACKAGE DESIGN  
APPROVAL FOR DUAL PURPOSE CASKS DURING INTERIM STORAGE**

**Frank Nitsche**

Federal Office for Radiation Protection, Salzgitter,  
Germany

**Frank-Michael Börst**

Federal Office for Radiation Protection, Salzgitter,  
Germany

**Ingo Reiche**

Federal Office for Radiation Protection,  
Salzgitter, Germany

**ABSTRACT**

The Federal Office for Radiation Protection (BfS - Bundesamt für Strahlenschutz) is the competent authority for package design approval for transport as well as the competent authority for licensing of interim storage facilities for spent nuclear fuel and vitrified high level radioactive waste in Germany.

The concept of interim storage in Germany is based on dry transport and storage casks (dual purpose casks) which are placed in storage facilities. For such a cask a package design approval according to applicable national transport regulations consistent with IAEA Transport Regulations is necessary to transport the cask to the interim storage facility, to be able to ship the cask if necessary during the interim storage period and finally to transport it to the final destination when the interim storage period is finished. Such a package design approval is also a key element for the safety demonstration of the interim storage facility.

To take all these aspects into account a regulatory concept has been developed in Germany which will be described in the paper. It considers basically three phases:

- a) first issuance of the package design approval certificate as a prerequisite for transport and for the interim storage license,
- b) review and renewal of the package design approval certificate during interim storage period, and
- c) use of the package design approval certificate at the end of the interim storage period including actions to be taken before the shipment from the facility to the final destination.

Based on practical experience with this concept some basic conclusions are derived for package designs subject to interim storage.

## INTRODUCTION

The German concept of interim storage of spent fuel or vitrified high level radioactive waste is based on dry transport and storage casks (dual purpose casks) which are stored in storage facilities. These casks are designed in such a way that

- a) for transport they meet all applicable requirements of national transport regulations [1], consistent with IAEA Regulations for the Safe Transport of Radioactive Material, TS-R-1 [2] and all of them have a Type B(U)F package design approval certificate, and in addition
- b) for storage they meet specific requirements resulting from interim storage conditions as described in [3].

These casks are placed in storage facilities as shown e.g. in Fig. 1.



**Figure 1. Example for storage of dual purpose casks in a storage facility in Germany (from BfS Jahresbericht 2012)**

According to the German concept a storage license for a facility can only be granted if a Type B(U)F package design approval certificate for the casks has been issued. The storage license is valid for 40 years. In such a license it is required that during the storage period there is always a valid Type B(U)F certificate for the casks or it is demonstrated by the licensee to the supervision authority of the storage facility every five years that the cask can be transported in full compliance with the applicable transport regulations. This requirement has been established to guarantee the transportability of the casks during and in particular at the end of the interim storage period.

To implement this requirement in practice a regulatory concept regarding the transport package design approval process during interim storage has been developed. It is based on maintaining the validity of the package design approval certificate during the whole interim storage period.

The main elements of the concept will be described in the following, and some basic conclusion will be derived for package designs subject to interim storage.

### **PACKAGE DESIGN APPROVAL BEFORE STORAGE**

Dual purpose casks can only be stored in the interim storage facility if they have a valid Type B(U)F package design approval certificate. The package design approval procedure in Germany is described in detail in [4]. Fig. 2 provides an overview on this procedure. Specific guidance for the applicant regarding the safety analyses report is given in [4] and [5].

At this stage, before storing the cask in the facility, the package design is subject to the normal approval procedure for transport as mentioned above but taking into account within this process additionally some specific aspects resulting from the use of the package as a storage cask, as follows:

- a) The package design has to be defined as part of the dual purpose cask design which includes all technical and constructional details and specifications which are necessary to meet the safety criteria for transport and interim storage.
- b) The long term behaviour of safety related material properties and safety functions of the package design has to be considered as far as possible in the assessment of the package design. Credit can be taken from the well known environmental conditions the cask will be subject to within the interim storage facility and also from the well known conditions of the dry atmosphere inside the cask.
- c) As part of the quality assurance documents there have to be developed plans for repeated testing of the loaded package before transport from the storage facility to confirm that the package still complies with all provisions of the package design certificate after the interim storage period.

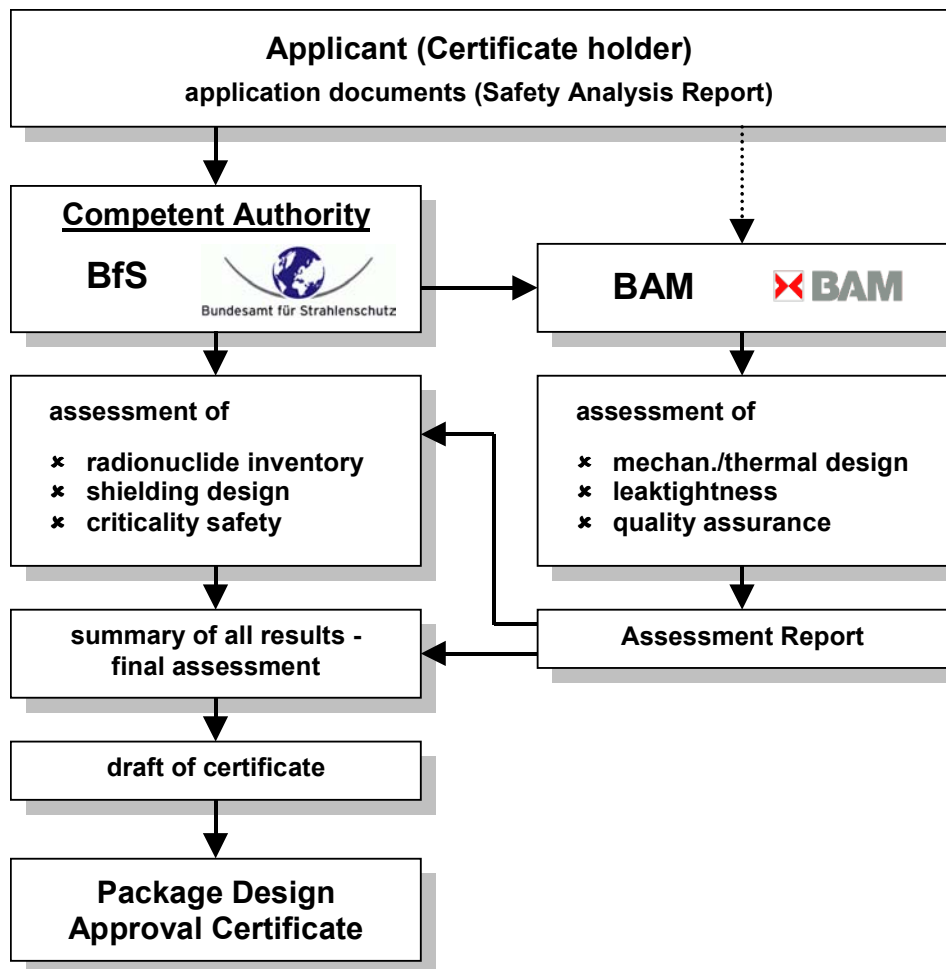
These are important aspects of the package design approval procedure of a dual purpose cask before it will be transported to the storage facility. The Type B(U)F certificate is issued by BfS and it contains in particular the above mentioned package design specification and plans for repeated testing. It has a validity period of 5 years and can be extended on a 5 year basis as long as such casks are loaded and shipped to interim storage facilities. During this time the package design certificate is also subject to normal revision procedures if needed.

### **PACKAGE DESIGN APPROVAL DURING INTERIM STORAGE PERIOD**

A new situation arises when the loadings of the dual purpose casks of a specific design have been completed. That means that shipments to the storage facility don't take place anymore and the casks are just stored as they are. Under these circumstances BfS issues the package design certificate with a validity period of 10 years with the following special provisions:

- 1) If new transport regulations will come into force during this validity period the package design certificate holder has to evaluate if they will affect the safety analyses report the certificate is based on. This assessment has to be documented and sent to BfS and the Federal Institute for Materials Research and Testing (BAM - Bundesanstalt für Materialforschung und – prüfung) not later than 6 months after enactment of new regulations.
- 2) 5 years after issuing the package design approval certificate the certificate holder has to provide to BfS and BAM an assessment report to confirm that all safety related technical provisions, specifications and safety demonstrations the safety analyses report is based on are still valid. This report is a prerequisite for maintaining the validity of the certificate for the next 5 years. It becomes part of the certificate after its approval by BAM and BfS.

The documents according to 1) and 2) are also useful elements to simplify the procedure to extend the validity of the package design approval certificate after 10 years for another 10 years.



**Figure 2. Overview on package design approval procedure in Germany**

The work to be done under 1) is mainly to identify if there are any changes in new transport regulations which have an impact on the package design safety report and, if so, to provide appropriate solutions to maintain the safety analyses report and the package design certificate consistent with the regulations in force. This procedure is considered to be adequate since a high degree of stability in the IAEA Transport Regulations can be expected for the future due to the already implemented high level of safety of the package design related provisions.

The assessment report according to 2) needs to contain the following elements:

- Assessment of the impact on the package design safety analyses report resulting from the state of the art of applicable regulations, technical standards and methods of safety demonstration,
- Assessment of operational experience during storage and identification and documentation if necessary of any changes which have to be made to update the design specifications, the instructions for use and maintenance of the cask and in particular the plans for repeated testing of the loaded cask before transport, and
- Assessment of aging effects and if necessary documentation of their implications on the safety related design specifications, the instructions for use and maintenance of the cask and in particular the plans for repeated testing of the loaded cask before transport.

This review procedure together with the renewal procedure of the package design approval certificate every 10 years provide a well monitored process to maintain the validity of the package design approval certificate for transport over the lifetime of the dual purpose cask as storage cask in the interim storage facility. This process allows in a documented manner to take into account operational experience, latest developments in regulations, the state of the art of technology and safety demonstration and in particular latest findings regarding aging effects with relevance to transport safety over the whole interim storage period. If a deficiency is identified during this process then measures will be derived and documented and included in the package design approval certificate. Their implementation at the concerned casks will then take place at the end of the storage period before the transport from the storage facility will start.

### **PACKAGE DESIGN APPROVAL AT THE END OF INTERIM STORAGE PERIOD**

Based on the above described process any cask in the storage facility has a valid Type B(U)F package design approval certificate at the end of the interim storage period. But before the transport from the facility can take place all actions and measures must be performed as specified in the plan for repeated testing of the loaded cask before transport and if applicable as derived from the review process during interim storage as described above.

The plan for repeated testing of the loaded cask before transport contains for example such measures like

- Inspection of the records of the leak-tightness supervision system during storage
- Check of all cask related documents for completeness and consistency including the package design approval certificate
- Visual inspection of the cask
- Inspection of the containment system and leak-tightness test
- Inspection of the trunnions including tests

If additional measures have to be performed as derived from the above described review process then such measures will also be included in the plan for repeated testing before transport or separately specified within the Type B(U)F package design approval certificate.

All measures to be performed before transport are supervised by BAM or other entitled expert organization. Only if all measures and actions are successfully completed the transport of the cask from the interim storage facility can take place.

### **SUMMARY AND CONCLUSIONS**

To ensure the transportability of dual purpose casks from an interim storage facility a regulatory concept has been introduced in Germany which is based on maintaining the validity of the Type B(U)F package design approval certificate during the interim storage period. The main elements of this concept consist of a Type B(U)F package design approval certificate with a validity period of 10 years, which can be extended further every 10 years until the end of the storage period and impact assessment reports to take into account changes in transport regulations, operational experiences and aging effects during the storage period. These reports are subject to competent authority approval and are required 5 years after each extension of the certificate. Based on this very well documented process appropriate measures and actions can be derived and taken at the end of the interim storage period to make sure that the dual purpose cask can be transported in compliance with the applicable transport regulations at the time of transport from the facility.

BfS has already issued some Type B(U)F package design approval certificates for dual purpose casks with a validity period of 10 years. Currently the first impact assessment report is under review and first experiences show good results.

There are some specific aspects to be taken into account if a package design shall be approved according to IAEA Transport Regulations which is intended to be used as a storage cask as well:

- a) the design specification must meet both transport and storage requirements,
- b) the long term behaviour of safety related material properties and safety functions of the package design should be considered as far as possible in the package design assessment work including aging effects under the well known conditions during interim storage.
- c) plans for repeated testing of the loaded package before transport from the storage facility should be part of the quality assurance documents to demonstrate conformity with the certificate of approval also at the end of the interim storage period.

The safety analyses report of the package design should include these aspects.

Regarding the regulatory framework for transport it should be reviewed if this special case of using a transport package also as a storage cask needs additional considerations in the future revision of SSR-6 [6] and TS-G-1.1 [7]. In SSR-6 e.g. this aspect could be considered under the requirements for the management system of the package design in particular as a design and maintenance issue where additionally aging effects during a longer time period should be included and as an operational issue on how to demonstrate compliance with the regulatory requirements before transport from a storage facility. Additional and more comprehensive guidance material in TS-G-1.1 should be developed to provide more explanation and advice on this subject. In this regard it should be noted that the IAEA currently prepares "Guidance for preparation of a safety case for a dual purpose cask containing spent fuel".

## REFERENCES

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