

**Joint Working Group on Guidance for
an Integrated Transport and Storage
Safety Case for Dual Purpose Casks for
Spent Nuclear Fuel**

Terms of Reference

Background

Spent nuclear fuel is generated from the operation of nuclear reactors and needs to be safely managed following its removal from reactor cores. The reactor pool capacities were designed based on the assumption that the fuel would be removed after a certain time either for reprocessing, disposal or other disposition options. As the result of delays in decisions on spent fuel disposition, the volume of spent fuel discharged from reactors which needs to be stored is growing and, in an increasing number of cases, exceeding the spent fuel pool capacities. Therefore additional storage capacity is needed.

Options for additional storage include wet storage in some form of storage pool or dry storage in a facility or storage casks built for this purpose. One of these options is the use of the dual purpose cask designed for both transport and storage. These dual purpose casks are an attractive option because of their flexibility and economical efficiency.

There are separate regulations that need to be complied with for both transport and storage for the dual purpose cask. In order to provide guidance to member states for integrating the safety cases for storage and transport in a holistic manner, the establishment of a joint international working group was recommended by International Conference on Management of Spent Fuel from Nuclear Power Reactors hosted by IAEA in June 2010. This document is the Terms of Reference for the “Joint Working Group on Guidance for an Integrated Transport and Storage Safety Case for Dual Purpose Casks for Spent Nuclear Fuel”.

Objectives of the Working Group

The objectives of the Joint Working Group are to prepare:

1. An IAEA Safety Report (as a supporting document to DS284, SSG 15 and TS-G-1.1) containing recommendations and guidance for the structure and contents of a Integrated Safety Case for a dual purpose Storage and Transport Cask. These recommendations shall include consideration of the requirements for both the storage and transport of the casks. The Safety Report should aim to assist designers, vendors, operators, applicants, regulators, technical support organisations, etc. in the development and review of the safety case and supporting safety assessment. The Safety Report should contain guidance that can be used, irrespective of how the safety case and safety assessment process is addressed within individual national regulatory frame works. The Safety Report will be limited to short and long term dry storage as defined in Appendix I of SSG -15 (DS 371).
2. Recommendations, to TRANSSC, WASSC, RASSC and NUSCC as appropriate, for changes to be made to existing IAEA requirements and guidance relevant to the licensing and use of Storage and Transport Casks.

On completion of the work, the Joint Working Group should consider whether further work should be done on other dry storage systems, for instance canister based systems, and other types of facility such as research reactors.

An Integrated Safety Case aims to support the application for the package design approval for transport and the application for the licensing of the storage facility (as part of the safety case for the storage facility). The Integrated Safety Case for a dual purpose storage and transport cask should be a collection of scientific and technical arguments and evidence in support of:

- The demonstration of compliance with the transport regulations TS-R-1 at the moment of transport, including transport after storage,
- The demonstration of compliance with the national regulations for spent fuel dry storage as they apply to the dual purpose cask itself during storage.

Note: This safety case for the dual purpose cask needs to be complemented by another safety case for the storage facility.

Scope and Output of the Working Group

1. Scope

- 1.1. The general scope of the work of the Working Group is to provide guidance material on the preparation of Safety Cases for dry cask Storage and Transport Systems. For the purposes of the WG “Storage” (Short and Long term) is defined in Appendix I of SSG -15 (DS 371). The term Safety Case is explained under objectives.
- 1.2. The WG shall make recommendations for a Regulatory Authority approval system which issues a single Cask approval covering both storage and transport.
- 1.3. There will be a project definition phase during which the Working Group will agree the full scope of their work. During this phase the WG will agree the terminology which will be used.
- 1.4. The initial scope will only consider dual purpose metal storage and transport casks. Only dry storage in casks shall be considered. There shall, however, be a subgroup to consider storage and transport canisters which shall make recommendations to the full working group for future action. The implications of the findings of the WG on other dual purpose systems (overpack systems, high level waste casks, non-metallic casks, etc.) and multi-use casks should then be examined as appropriate.
- 1.5. A dual purpose cask is one which is used for transport and storage. Multi-purpose casks designed for transport, storage and ultimate disposal are outside of the scope of the work of the WG. A consequence of this is that it

must be practicable to retrieve the fuel from the cask after either storage or transport.

- 1.6. For the purposes of the work of the WG the term Cask shall be assumed to include the internal fittings and the radioactive contents.
- 1.7. The scope of the work shall be limited to considerations of safety but due consideration shall be given to the need to ensure that safety requirements are compatible with security and safeguards requirements.
- 1.8. The WG shall detail what does and what does not have to be included in a Storage and Transport Safety Case.

2. Interface issues

- 2.1. The WG shall consider how the interfaces between the Safety Cases for the Storage and Transport Casks, the Storage Facilities, Nuclear Power Plants, reprocessing and disposal facilities shall be managed.
- 2.2. Before it is stored in a cask, the fuel will have been subjected to a number of processes, including irradiation in the reactor, handling operations and pool storage, all of which can influence the physical integrity of the pins and the structural components. The history of the spent fuel before cask storage is, therefore, an important input into the safety case. In the safety case there should be well-defined acceptance criteria which the spent fuel must meet before it is considered fit for cask storage and transport.
- 2.3. The WG shall consider how the Safety Case for the dual purpose cask relies on the availability of hot cells, cooling pools, reserve storage capacity and other maintenance facilities which may be present at the storage sites or at other remote sites. As a basic concept, dual purpose casks can be designed so that the lid which is a part of the primary containment boundary need not to be opened for inspection or maintenance during storage and transport after storage, so long as the safety is demonstrated by the safety evaluation using elementary test results, mock-up test results or computer analysis etc., in advance. This is a great advantage of dual purpose metallic casks because actions to open lids need additional equipments such as hot cells and such actions themselves may cause unnecessary accidents. However, some systems use casks which have a single containment boundary. In these circumstances it is necessary to provide maintenance facilities which can be used to maintain the cask in the event of failure of that containment boundary.

3. Details

- 3.1. Subject to agreement by the WG the storage period starts when the spent fuel is first loaded in the spent fuel dual purpose cask.
- 3.2. The WG shall determine at what point during the storage and transport cycle the transport phase starts. For example, does it start when the cask is first closed or when it is first consigned for transport?

- 3.3. It may be necessary, in some circumstances, to remove fuel from a dual purpose cask and to repackage it into a different cask. The implications of re-packaging of fuel during cask storage on the storage and transport safety case need to be considered.
- 3.4. Credit is often taken during on-site transfer operations from off-site transport approvals. Whilst such approvals can be rigorous and indicative of the overall quality of a cask they are tailored to demonstrating compliance with a set of criteria which may not be relevant to on site operations. Compliance with an off site transport approval is not, therefore, a guarantee of suitability of the cask for storage and on site handling. Likewise compliance with storage and on-site transfer approval is not a guarantee of suitability of the cask for off-site transport. The WG shall identify the risks associated with, and specify the safety guidance for, on-site transfers.
- 3.5. The WG shall identify and specify the safety requirements for storage. Useful background documents for this purpose are:
- SSG 15 (DS 371) Chapter 5
 - DS 284 Chapter 4
 - GS-R-5
 - WENRA - Waste and Spent Fuel Storage Safety Reference Levels Report Oct 2.0
 - Existing national regulations and guidance material
 - USA – 10 CFR 72
 - USA – NUREG 1536 – Standard Review Plan for Dry Cask Storage Systems
 - USA – NUREG 1567 Standard Review Plan for Spent Fuel Dry Storage Facilities.
 - German RSK Safety Guideline for Dry Interim Storage of Irradiated Fuel Assemblies in Storage Casks, April 5 2001,
 - Japanese Regulatory guide: Reviewing Safety of Spent fuel Interim Storage Facilities using Metallic Dry Casks (Nuclear Safety Commission of Japan)
 - Japanese Technical Report of the Nuclear Fuel Cycle Safety subcommittee (June 25, 2009) (Nuclear and Industrial Safety Agency)
 - SUJB Guideline BN-02.2 (CZ)
 - IAEA-TECDOC-1532 - Operation and Maintenance of Spent Fuel Storage and Transportation Casks/Containers
- 3.6. The safety requirements for off-site transport for existing applications are well understood and specified in TS-R-1. The safety requirements for off-site transport after several decades of storage are less well understood. The WG shall review the requirements of TS-R-1 for their relevance to transport after storage and, as necessary, make recommendations for changes to those regulations to TRANSSC.

- 3.7. The WG should recognise in its guidance that staff on a site which is primarily a storage facility will not necessarily have the competence to manage the consignment of a transport package. It may not always be sufficient to contract in a specialist transport company to consign a cask and consideration should be given to the level of training, in transport operations, required by the storage site personnel.
 - 3.8. The WG shall give consideration to specifying the scope of a Management System which clearly identifies management roles and responsibilities during all phases of the storage and transport processes.
 - 3.9. The WG shall consider how records of the history of the fuel and casks prior to and during storage shall be maintained throughout and following the storage period.
 - 3.10. The integrated Safety Case shall consider the influences of ageing mechanisms (chemical, mechanical, thermal, irradiation, changes in reactivity etc). The WG shall consider these effects in its determination of the requirements for storage and transport.
 - 3.11. The WG shall give consideration to specifying a surveillance and maintenance regime which ensures that the casks are in a state fit for preparation for transport throughout the whole of the storage period.
 - 3.12. Subject to confirmation by the WG the dual purpose cask must have a transport approval before the start of the storage period.
 - 3.13. The WG shall consider how changes to the applicable requirements, including national and international regulations, during the storage period shall be addressed in the Storage and Transport safety justification. Methods to be considered shall include “Gap analysis” and transitional arrangements such as “Grandfathering”. For the purposes of this discussion Gap analysis means identification and evaluation of the impact of the differences between the initially approved storage and transport assessment and any new regulatory requirements or technical findings. The term “Grandfathering” for transport approvals is discussed in section 8 of IAEA TS-G-1.1.
4. Expected Output of the Working Group
- 4.1. An IAEA Safety Report (as a supporting document to DS284, SSG 15 and TS-G-1.1) containing recommendations and guidance for the structure and contents of an Integrated Safety Case for a dual purpose Storage and Transport Cask.
 - 4.2. Recommendations, to TRANSSC, WASSC, RASSC and NUSSC as appropriate, for changes to be made to existing IAEA requirements and guidance relevant to the licensing and use of Storage and Transport Casks.

Working Methods and Plan

1. Working Methods

- 1.1. Those working methods could include further meetings, consultancies, and correspondence groups.
- 1.2. The IAEA secretariat shall schedule the meetings of the WG.
- 1.3. The planning assumption is that a WG plenary will meet once a year, normally in Vienna. As determined by the WG other meetings and consultancies may take place.
- 1.4. The target date for completion of the work of the WG is the end of 2013.
- 1.5. The WG will give consideration to concepts such as; probabilistic safety assessments, defence in depth, radiation protection principles such as ALARA and ALARP, deterministic safety assessment of transport packages, etc.
- 1.6. The existing guidance documents published by the IAEA are generic in nature. The output of the WG shall be specific. As far as is practicable worked examples will be used to explain the application of the methodology described in the Safety Report. Candidates for such specific examples would include aging assessments of metallic and elastomeric seals, closure and trunnion bolts and neutron shielding materials.
- 1.7. The WG should consider the template provided in the “Technical Guide - Package Design Safety Reports for the Transport of Radioactive Material” for the structure of the Storage and Transport Cask Safety Case. This publication is available from several Transport Competent Authority web sites including those of the UK DfT, French ASN and German BfS.
- 1.8. There are a number of other IAEA working groups and consultancies whose activities relate closely to the work of this WG. The WG shall take advice from the IAEA secretariat to ensure that its work is aligned with that of the other groups and consultancies, so far as is practicable, to avoid duplication of effort.
- 1.9. **There shall be a specific subgroup on canister-based solutions which shall provide specific recommendations for incorporation into the TECDOC.**

2. Working Plan

- 2.1. It is expected that at its first plenary meeting, the Working Group will produce an outline draft of the Safety Report together with a programme for its completion. It is envisaged that drafting of the report will be progressed in the periods between the plenary meetings by allocating work packages to subgroups or members of the WG.

- 2.2. The results of subgroups or members will be assembled as the preliminary draft of the Safety Report within nine months after the first plenary meeting.
- 2.3. The second WG meeting will be convened within twelve months after the first meeting. It is expected that a consolidated first draft will be reviewed, commented, and revised. Revised or new work packages will be assigned to subgroups or members at the second meeting.
- 2.4. The results of subgroups or members will be assembled as the consolidated draft of the Safety Report within nine months after the second plenary meeting.
- 2.5. The third WG meeting will be convened within twelve months after the second meeting. It is expected that a final draft will be prepared and submitted to IAEA for publication.