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ENSURING SAFE TRANSPORT OF RADIOACTIVE MATERIALS: IMPLEMENTATION OF THE 2012 IAEA TRANSPORT REGULATIONS (SSR-6)

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ABSTRACT

As technology has evolved and the industry surrounding the transport of radioactive material has similarly evolved, transport regulations have continued to focus on safety, with necessary changes made to maintain safety without unnecessarily restricting transport operations. The 2012 Edition of the IAEA Regulations for Safe Transport of Radioactive Material, SSR-6, introduces a number of changes. The majority of the changes are related to fissile exceptions.

Simultaneously, the Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material was revised in accordance with the changes introduced to the Regulations and two new annexes were added to the Advisory Material to further improve understanding of Regulations.

This paper describes the main changes in the 2012 Edition of IAEA Transport Regulations and Advisory Material.

BACKGROUND

The effort to develop a standard set of recommended requirements for the packaging and transport of radioactive material that could be adopted internationally began even before the official formation of the International Atomic Energy Agency (IAEA) in the late 1950's. Today's IAEA Regulations for the Safe Transport of Radioactive Material (the Regulations) [1] are a direct result of those efforts. The current edition of the Regulations (2012), and in some cases, preceding editions, provide the basis, in many countries, for harmonized transport regulations. The regulations also provide these bases at the international modal level. As an example, the latest edition of the United Nations Recommendations on the Transport of Dangerous Goods — Model Regulations (UN Orange Book) [2] all regulatory requirements related to radioactive material transport are a direct incorporation of the IAEA Transport Regulations. The Orange Book serves as the model for international modal regulations issued by organizations such as the International Civil Aviation Organization (ICAO) for air transport, the Universal Postal Union for transport by post, the International Maritime Organization (IMO) for maritime (sea) transport, and the United Nations Economic Commission for Europe (UNECE) as well as other

international organizations for the various land transport modes (road, rail, and inland waterway) transport within Europe and throughout the world. In general, IAEA regulatory requirements from transport have been harmonized throughout the international regulatory system, albeit not perfectly. Harmonization of international regulations is still an ongoing area of work for the Agency and its partner organizations.

The Preparatory Commission of the International Atomic Energy Agency, in 1957, stated [3] that the "*Agency might obtain information on the work which has been done in, and consider the formulation of regulations governing, (i) the transport of radioactive materials, (ii) the transport of radioactive waste to burial grounds, ...*".

A discussion on how the Agency might staff and organize this effort ensued and included the note that an advisory panel to assist in this effort might be appointed, "which might later be transformed into a standing committee." Today this committee is known as the Transport Safety Standards Committee (TRANSSC)

Further, the Commission noted that the "Agency should take measures for preparation and distribution, in consultation with other international organizations concerned, problems related to the international transport of radioisotopes, particularly of short-lived radioisotopes."

The United Nations Economic and Social Council (ECOSOC) addressing the transport of dangerous goods in general, followed in 1959 by passing a resolution [4] that, among other things, noted progress made by the "*new Committee of Experts on the Transport of Dangerous Goods*", requested the "*Secretary General, in light of the relevant recommendations contained in the report of the Committee of Experts*", to continue the Committee of Experts, to explore "*the possibility of finding mutually acceptable performance tests for outer packages for certain classes or groups of dangerous substances*", and – more significantly – to "*inform the International Atomic Energy Agency of the desire of the Council that the Agency be entrusted with the drafting of recommendations on the transport of radio-active substances, provided that they are consistent with the framework and general principles of recommendations of the Committee of Experts on the Transport of Dangerous Goods of the United Nations, and that they are established in consultation with the United Nations and the specialized agencies concerned*."[5]

INTRODUCTION

The IAEA has produced Regulations related to the transport of radioactive material for over 50 years. The latest Edition [1] was published in 2012 as Specific Safety Requirements No. SSR-6 (SSR-6), and is based on several revisions to the Edition published in 2009 (TS-R-1). In response to resolution GC(56)/RES/9 from the 56th General Conference of the IAEA, a new review cycle for the Regulations (SSR-6) and the associated Advisory Material, *Advisory Material for the Regulations for the Safe Transport of Radioactive Material,* (TS-G-1.1) [6] was started in January, 2013 and closed in May, 2013. Comments received within the review period from Member States and other interested parties, including organizations representing the transport industry, were considered by the Agency as part of the current review cycle. These comments were reviewed, categorized, and presented to TRANSSC for their consideration at the 26th meeting of the Committee in June.

SAFETY STANDARDS REVIEW CYCLE

In general, the review cycle for the Regulations is every two years based on a decision by TRANSSC to follow the review cycle of the UN Orange book, but the *revision* cycle can be demonstrably longer. If TRANSSC decides that revisions to the Regulations are warranted, then the Regulations are essentially

"frozen" until the next review cycle. The review cycle enables Member States and other involved bodies to propose changes or revisions to the Regulations. The comments received are reviewed by Agency staff, with the intent of providing a comment response or resolution to be published at a later date. While all comments received in a timely manner are considered, not all comments will lead to a change in the Regulations, as not every review cycle will lead to an actual revision of the Regulations.

Ultimately, it is a decision of TRANSSC to initiate a revision cycle for the Regulations. Changes to the Regulations are made with a focus on safety and, as a rule, other than editorial changes, corrections to the regulatory text, or changes related to the clarity of the regulatory language, if a proposed change does not have a clear safety impact (i.e., enhance safety in some measurable way), it will generally not result in a revision of the Regulations. The cost of a revision to the Regulations, as well as the cost for implementation of revised Regulations, while not a driver for the decision to revise, is a consideration. The best possible outcome for Member States is when changes to the Regulations enhance safety ***and*** reduce costs for implementation of the Regulations. While this may not be the outcome for every change to the Regulations, increasing consideration is being given to the effect that changes to the Regulations have on those responsible for implementing them. For the Agency to demonstrate good stewardship of the resources provided by Member States, the costs of making a regulatory change must be weighed against the commensurate gain in safety. Without a clear safety gain, the expenditure for a revision of the Regulations is difficult to justify.

STABILITY OF THE REGULATIONS

Given the current Agency practices regarding the review and revision cycles, there could be a period of up to 4 years before publication of a new revised edition of the Regulations actually occurs. The existing safety record and demonstrated maturity of the current transport regulations make a strong case for reducing the frequency of review and, therefore, potential changes to the Regulations. For every revision of the Regulations, there is a consequent administrative and financial burden experienced by Member State competent authorities and those in the transport industry who are required to implement the latest Regulations. For Member States that have a specific edition of the Regulations defined in their national legislation, the often lengthy process of a legislative change will be needed in order to implement new editions of the Regulations. A sufficient period of time without changes to the Regulations could increase stability and aid Member States in establishing the most recent version of the Regulations as part of their national regulations for transport of radioactive material.

On the other hand, there must always be a mechanism in place to make changes that significantly affect safety as transport experience, increased risk, or new technologies highlight areas where changes in the Regulations are warranted. This is an area where risk insights could potentially be employed to determine the efficacy of a proposed change. A cost-benefit consideration could also be developed in order to introduce cost as a consideration into the process for determining the expected efficacy of changes. A further challenge to the extending the review cycle for the IAEA transport regulations is the current practice of a two year review and revision cycle by other UN bodies for their regulations and guidance for transport of dangerous goods, which includes Class 7 (radioactive) material. This is discussed further below.

HARMONIZATION OF TRANSPORT REGULATIONS

The UN Orange Book are recommendations and incorporate the IAEA transport regulations to cover the transport of Class 7 (Radioactive) material. The latest version of the UNOB (18^{th} revised edition) incorporates the 2012 Edition of the IAEA transport regulations (SSR-6). Each of the UN Modal bodies,

ICAO and IMO, for example, have their respective regulations for their specific modes of transport. In the case of ICAO it is the "Technical Instructions for the Safe Transport of Dangerous Goods by Air" [8] and for IMO it is the "International Maritime Dangerous Goods Code" [9]. These requirements are mandatory for shipments in the respective modes (air and sea), are revised every two years, and are generally harmonized with the IAEA transport regulations; however, efforts to fully harmonize the modal regulations with IAEA transport regulations are ongoing. Further, the European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) [10] and European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN) [11] which are reviewed and issued by the UNECE through the work of the Subcommittee of Experts on the Transport of Dangerous Goods (SCETDG), also provide recommendations for the specific modes and require further efforts to ensure harmonization with the IAEA transport regulations. Agency staff actively participates in the review meetings of these various UN bodies and TRANSSC has recently adopted a role to review working papers submitted to the SCETDG for relevance to radioactive material transport.

An even greater challenge in the area of harmonization lies with Member States and that is related to the differences between national requirements related to radioactive material shipments. It continues to be the Agency's position that packages that are designed and fabricated to meet the IAEA transport regulations should be acceptable for transport to, from, or through any Member State. In practice, however, challenges continue to exist in the area of denial of shipment, and some of these challenges can be attributed to the differences in the regulations between countries. Further harmonization efforts are clearly needed to resolve these issues, as well as continued efforts to build effective transport networks that increase the effectiveness of communications between countries.

CHANGES TO THE TRANSPORT REGULATIONS

The 2012 Edition of the transport regulations (SSR-6) saw included changes in the areas of Definitions, Fissile Material Exceptions, Package shipment requirements, and Documentation, among other changes both editorial and otherwise. Brief descriptions of the nature of the changes in each of the aforementioned areas are provided below.

Many of these changes were primarily targeted at improving clarity of the regulations, as well as generally improving the safety of transport while, in some cases, reducing regulatory burden.

Definitions

Definitions for 'Fissile nuclides and fissile material', 'freight container', 'Design' and 'Exclusive use' were modified while the definition for 'Management Systems' was added to replace 'Quality Assurance'.

Fissile Material Exceptions

With the publication of the 2012 Edition of the Agency's Transport Regulations Requirements for packages containing fissile material were significantly changed on the basis of new needs arising from industry advances and technology changes while seeking to maintain a high level of safety. In the new 2012 revision a three tier system was introduced for the same types of material.

The new middle tier only exempts the material from some requirements (essentially the new tier adds administrative controls to some of the consignments that were previously in the "excepted" category). At the same time revised limits were introduced, some existing concepts were discontinued and some new ones were added.

The new methodology which gave rise to these three tiers is much more rigorous than the previous methodology. The concepts are:

- Consignments complying with paragraph 417 are safe without significant operational control
- Consignments complying with paragraphs 674 or 675 require some operational controls to assure safety, but represent quantities of material that are safe due to the small amounts being carried.

Package Shipment Requirements

New requirements were introduced for confirmation of design conformity with the regulations prior to first shipment (Paragraph 501), while each shipment of a package must have the contents verified by the shipper before shipment (Paragraph 502).

Documentation

Clarifications in Paragraphs 584 -588 that appropriate documentation for a consignment must be received by a carrier before they accept the consignment for transport.

A document listing the changes in the 2012 Edition of the Transport Regulations (in comparison with the 2009 edition) is available on the Agency website. [12]

The 2009 Edition of TS-G-1.1[6] has also been revised to support the latest version of the Transport Regulations and was recently published as SSG-26.

CONCLUSIONS

The IAEA's Transport Regulations have demonstrated over 50 years of success contributing to an enviable safety record in transport of radioactive material. While the Transport Regulations continue to receive reviews at regular intervals from TRANSSC, the concept of regulatory stability, in combination with the demonstrated safety record, suggest that the review cycle could potentially be lengthened for the current regulations. Harmonization of the current Transport Regulations continues to be a focus of the Agency, as these efforts will yield immediate improvements in the reliability of the global transport network for radioactive materials. The Agency is committed to continue to uphold the high standard of quality for which the current Transport Regulations are known and to make changes only when clear improvements to safety can be made.

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