Proceedings of the 19th International Symposium on the Packaging and Transportation of Radioactive Materials
PATRAM 2019
August 4-9, 2019, New Orleans, LA, USA

A new edition of the IAEA Transport Regulations: which consequences and lessons for the Industry?

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ABSTRACT

Transport of radioactive material has to comply with the national and international modal regulations for the transport of dangerous goods. All these regulations are based on the requirements set forth in the "Regulations for the Safe Transport of Radioactive Material" (SSR-6) established by the International Atomic Energy Agency (IAEA). The Regulations follow a two-year review cycle. The review triggers – when deemed necessary – a revision of the Regulations.

The last cycle is now completed and culminated in 2018 with the publication of a new edition of the Regulations for the Safe Transport of Radioactive Material. The companion guide, "Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material", is currently in the last steps of revision to be aligned with the 2018 Edition of the IAEA Transport Regulations.

Significant changes have been introduced. This includes – inter alia – the deletion of the leaching test from the requirements for LSA-III material, the provisions for a new group SCO-III of Surface Contaminated Objects (SCOs), the incorporation of the concept of dual-purpose cask through the new requirements for shipment after storage and the subsequent explicit requirement for all packages to take into account ageing mechanisms. In the Advisory Material, the new guidance for the implementation of the requirements about pressure differential for packages to be transported by air is of importance for the Industry.

The paper provides indications about the practical consequences for the Industry of the main modifications which were accepted during the preparation of the new edition of the IAEA Regulations for the Safe Transport of Radioactive Material.

Furthermore, the paper also includes an analysis of the actions which were conducted, prior to or in parallel of the formal process, and that lead to the acceptance or rejection of the proposals. It will conclude with the lessons learnt by the Industry regarding the process for the review and revision of the IAEA Transport Regulations, and the conditions to be met to gain acceptance of a proposal for a significant change of the Regulations and / or of the Advisory Material.

INTRODUCTION

Transport of radioactive material has to comply with the national and international modal regulations for the transport of dangerous goods. All these regulations are based on the requirements set forth in the "Regulations for the Safe Transport of Radioactive Material" (SSR-6) established by the International Atomic Energy Agency (IAEA). The Regulations follow a two-year review cycle. The review triggers – when deemed necessary – a revision of the Regulations.

The last cycle is now completed and culminated in 2018 with the publication of a new edition of the Regulations for the Safe Transport of Radioactive Material. The companion guide, "Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material", is currently in the last steps of revision to be aligned with the 2018 Edition of the IAEA Transport Regulations.

Significant changes have been introduced. This includes – inter alia – the deletion of the leaching test from the requirements for LSA-III material, the provisions for a new category SCO-III of Surface Contaminated Objects (SCOs), the incorporation of the concept of dual-purpose cask through the new requirements for shipment after storage and the subsequent explicit requirement for all packages to take into account ageing mechanisms. In the Advisory Material, the new guidance for the implementation of the requirements about pressure differential for packages to be transported by air is of importance for the Industry.

In the following, indications about the practical consequences for the Industry of the main modifications which were accepted during the preparation of the new edition of the IAEA Regulations for the Safe Transport of Radioactive Material will be provided.

Furthermore, an analysis of the actions which were conducted, prior to or in parallel of the formal process and that lead to the acceptance or rejection of the proposals will be developed, in order to identify the lessons learnt by the Industry regarding the process for the review and revision of the IAEA Transport Regulations, and the conditions to be met to gain acceptance of a proposal for a significant change of the Regulations and / or of the Advisory Material.

LSA-III MATERIAL / LEACHING TEST

New requirements for LSA-III material

The IAEA Regulations for the Safe Transport of Radioactive Material defines low specific activity (LSA) material as "*radioactive material that by its nature has a limited specific activity, or radioactive material for which limits of estimated average specific activity apply*". Three groups are considered for the classification of LSA material, namely LSA-I, LSA-II and LSA-III.

In the 2012 Edition of the IAEA Transport Regulations [SSR-6], LSA material may only be classified as LSA-III material if it constituted of "s*olids (e.g. consolidated wastes, activated materials), excluding powders, that meet the requirements of para. 601* [leaching test], *in which:*

(i) *The radioactive material is distributed throughout a solid or a collection of solid objects, or is essentially uniformly distributed in a solid compact binding agent (such as concrete, bitumen and ceramic).*

(ii) *The radioactive material is relatively insoluble, or is intrinsically contained in a relatively insoluble matrix, so that, even under loss of packaging, the loss of radioactive material per package by leaching when placed in water for 7 days would not exceed 0.1A_2.*

(iii) The estimated average specific activity of the solid, excluding any shielding material, does not exceed 2 × $10^{-3}A_2$/g."

In the latest 2018 Edition of the IAEA Transport Regulations [SSR-6 (Rev. 1)], LSA material may only be classified as LSA-III material if it constituted of "s*olids (e.g. consolidated wastes, activated materials), excluding powders, in which:*

(i) The radioactive material is distributed throughout a solid or a collection of solid objects, or is essentially uniformly distributed in a solid compact binding agent (such as concrete, bitumen and ceramic).

(ii) The estimated average specific activity of the solid, excluding any shielding material, does not exceed 2 × $10^{-3}A_2$/g."

The requirements for a leaching test for LSA-III material has been deleted in the 2018 Edition of the IAEA Transport Regulations.

Elements of history of the deletion of the leaching test for LSA-III material

The deletion of the leaching test for LSA-III material is the outcome of a proposal from Germany, during the review and revision cycle that started at the beginning of the year 2015.

This proposal, referenced by the IAEA as D/2015/03, was supported by solid technical justifications, including testing of packages with LSA materials in very severe mechanical impact conditions with measurement of airborne release.

Prior to the German proposal, papers were presented during PATRAM 2010 [1] and PATRAM 2013 [2], to build awareness of the transport community, whilst the tests were performed before and reported as early as during PATRAM 2007 [3]. It must be emphasized also that the idea for this proposal existed earlier (i.e. for the revision cycle which led to the 1996 Edition of the IAEA Transport Regulations), but it was recognized at that time that robust technical justification needed to be provided. There was also a formal proposal submitted by Germany during the SSR-6 2013 Review Cycle, which started at the end of 2012, but this proposal could not be moved forward as the existing technical evidence had to be better structured to convince the other stakeholders.

After the proposal to revise the IAEA Transport Regulations was issued by Germany early 2015, the formal process of the IAEA to review the proposal was initiated. The proposal gained acceptance after a stringent review by all the parties involved in the process and necessitated several meetings, including consultancy meetings, which examined the proposal per se, but also all the subsequent consequences of the modification. This led, in addition, to the modifications proposed by Germany, to significant changes in the "Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material" (SSG-26), to enhance the guidance applicable to the required homogeneity of the material, in order to avoid accidental effects of the deletion of the requirement of the leaching test for LSA-III material.

To summarize, a long time was needed for this proposal (to delete the leaching test from the requirements for LSA-III material) to be accepted, from the initial idea or concept to the final publication of the revised IAEA Transport Regulations, through testing. Key parameters for the acceptance of this proposal include:

- time to get a mature proposal (and to assemble all information which are needed),
- solid technical justifications, and
- involvement of all the interested parties from the beginning (prior to the formal proposal to the IAEA through presentations in various symposium, such as PATRAM, and during the formal process through dedicated technical meetings held under the auspices of the IAEA).

Consequences of the deletion of the leaching test from the requirements for LSA-III material

LSA-III material is a group of LSA material that is not used often. Powders have been excluded from LSA-III material in the 1996 of the IAEA Transport Regulations. The leaching test is difficult to perform and to pass. The consequence is that some materials, which could have been classified as LSA-III material, were not considered as such. Consequently, these materials could not be transported in an

Industrial Package Type 2 (Type IP-2) or an Industrial Package Type 3 (Type IP-3), and had to be transported in a more challenging Type B(U) or Type B(M) package.

Removing the leaching test from the requirements for LSA-III material will simplify the IAEA Transport Regulations. It should overcome difficulties regarding different interpretations and implementations of the leaching test in practice, especially for radioactive waste. This simplification would generate a rebirth of the LSA-III material group, allowing more material to be classified in this category and to be transported in Industrial Packages Type 2 (Type IP-2) or Industrial Packages Type 3 (Type IP-3), and not in Type B(U) or Type B(M) packages. This should simplify the design of the packages, shortening the duration for their design, and – consequently – expedite the decommissioning of nuclear facilities, by facilitating the shipment of waste to the storage or disposal facilities.

NEW GROUP SCO-III OF SURFACE CONTAMINATED OBJECTS (SCOs)

Provisions for a new group SCO-III of Surface Contaminated Objects (SCOs)

The IAEA Regulations for the Safe Transport of Radioactive Material defines a Surface Contaminated Object as "*a solid object that is not itself radioactive but which has radioactive material distributed on its surface*".

In the 2012 Edition of the IAEA Transport Regulations [SSR-6], two groups of SCOs are defined, SCO-I and SCO-II. These two groups differ by the limits which are applicable to three parameters:

- the maximum non-fixed contamination on the accessible surface,
- the fixed contamination on the accessible surface,
- the non-fixed contamination plus the fixed contamination on the inaccessible surface.

In the latest 2018 Edition of the IAEA Transport Regulations [SSR-6 (Rev. 1)], three groups of SCOs are now defined. Provisions for SCO-I and SCO-II remain the same as in the 2012 Edition. Provisions for SCO-III are such that a Surface Contaminated Object may only be classified as SCO-III if it is "*a large solid object which, because of its size, cannot be transported in a type of package described in these Regulations and for which:*

(i) *All openings are sealed to prevent release of radioactive material during conditions defined in para. 520(e)* [(i) transport under exclusive use, (ii) stacking not allowed, (iii) transport plan, (iv) drop test, (v) securing to the conveyance, and (vi) multilateral approval]*;*

(ii) *The inside of the object is as dry as practicable;*

(iii) *The non-fixed contamination on the external surfaces does not exceed the limits specified in para. 508* [(a) 4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, and (b) 0.4 Bq/cm^2 for all other alpha emitters];

(iv) *The non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm^2 does not exceed 8 × 10^{5}Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 8 × 10^4 Bq/cm^2 for all other alpha emitters.*

SCO-III may be transported unpackaged, under the following conditions (in para. 520 (e) in the 2018 Edition of the IAEA Transport Regulations):

(i) *Transport shall be under exclusive use by road, rail, inland waterway or sea.*

(ii) *Stacking shall not be permitted.*

(iii) *All activities associated with the shipment, including radiation protection, emergency response and any special precautions or special administrative or operational controls that are to be employed during transport shall be described in a transport plan. The transport plan shall demonstrate that the overall level of safety in transport is at least equivalent to that which would be provided if the requirements of para. 648 (only for the test specified in para. 724, preceded by the tests specified in paras 720 and 721) had been met* [the object would prevent the loss or dispersal of the radioactive contents and more than a 20 % increase

in the maximum dose rate at any external surface of the package, if it were subjected to the penetration test (drop of a 6-kg bar preceded by the water spray test)].

(iv) *The requirements of para. 624 for a Type IP-2 package shall be satisfied, except that the maximum damage referred to in para. 722 may be determined based on provisions in the transport plan, and the requirements of para. 723 are not applicable* [the object would prevent the loss or dispersal of the radioactive contents and more than a 20 % increase in the maximum dose rate at any external surface of the package, if it were subjected to a drop test in conditions based on provisions in the transport plan].

(v) *The object and any shielding are secured to the conveyance in accordance with para. 607.*

(vi) *The shipment shall be subject to multilateral approval.*

Elements of history of the development of the concept of SCO-III

For the last two decades, the direct transport of large object (i.e. transport of unpackaged large objects, without size reduction) has been steadily increasing because of the decommissioning of nuclear power stations or replacing equipment for the extension of their operational life. Numerous types of equipment are contaminated. This equipment has to be treated, stored and discharged for disposal or recycling in a responsible and environmentally sensitive way at the end of their operational life. This equipment includes large objects (large components), such as reactor pressure vessels and steam generators (typically, over 20 metres long, 300 tons) [4].

Furthermore, it is predicted that the demand to transport large objects from nuclear fuel cycle facilities for equipment replacement, decommissioning, disposal or recycling will increase [5].

It is reasonable to transport them directly for disposal or to recycling facilities. However, due to the very nature of large objects, they cannot be transported within a package. The Special Arrangement procedure is commonly implemented for these shipments.

However, such impressive and high-profile transports are sometimes faced by strong opposition from the public even when the relevant Competent Authorities have approved them. For example, in Canada, Bruce Power's plan to transport 16 decommissioned steam generators from Canada to Sweden for recycling was forced to be cancelled in 2012 due to strong opposition from the public and local communities, both in Canada and the United States, even though the transport had been approved by the Canadian Competent Authority as being transportable under "Special Arrangement".

In connection with the anticipated opposition to this shipment, and following some request from Canada, there were discussions within the IAEA Transport Safety Standards Committee (TRANSSC) about the wording "Special Arrangement", as it is generally considered as misleading: "special" and "arrangement" are two words which might be taken to suggest that the situation is unsafe, even if the IAEA Transport Regulations provide assurance that a shipment carried out under the Special Arrangement procedure has an overall level safety at least equivalent to that of any other shipment.

> *Consignments for which conformity with the other provisions of these Regulations is impracticable shall not be transported except under special arrangement. Provided the competent authority is satisfied that conformity with the other provisions of these Regulations is impracticable and that the requisite standards of safety established by these Regulations have been demonstrated through means alternative to the other provisions of these Regulations, the competent authority may approve special arrangement transport operations (…). The overall level of safety in transport shall be at least equivalent to that which would be provided if all the applicable requirements in these Regulations had been met.*

However, it was concluded that it was not appropriate to modify the wording which has been in use since the origin of the IAEA Transport Regulations. In addition, it was also concluded that specific guidance would be beneficial: it was preferred to work on the technical ground rather than on the wording. A dedicated appendix was developed, Appendix VII "Guidance for transport of large components under special arrangement", for the 2012 Edition of the "Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material" (published in 2014), the companion document of the 2012 Edition of the IAEA Transport Regulations. The experience gained with the numerous transports of large objects which had been conducted under Special Arrangement was

considered. *This appendix (was) intended to be a standardized guidance for competent authorities to use as reference for large component special arrangement preparation and approval. It could also be used as reference for industries.*

The development of the new group SCO-III for Surface Contaminated Objects (SCOs) is the outcome of a proposal from Canada, during the review and revision cycle that started at the beginning of the year 2015. This proposal, refenced by the IAEA as CA/2015/01, was supported by the experience gained with the development of the above-mentioned Appendix VII "Guidance for transport of large components under special arrangement". The goal was to embed completely these Transports in the IAEA Transport Regulations, and then circumventing the difficulties with the potential misunderstanding of "Special Arrangement'" by the public.

There was also a formal proposal submitted by Canada during the SSR-6 2013 Review Cycle, which started at the end of 2012, but this review cycle did not lead to a revision cycle, on the one hand, and this situation gave time to finely tune the proposal, and somehow to expedite its acceptance in the 2018 Edition of the IAEA Transport Regulations during the review and revision cycle that started at the beginning of the year 2015, on the other hand.

Both during and prior the formal process of the IAEA to review the proposal, there were a lot of meetings (face to face meetings and conference calls) initiated or arranged by Canada with all the interested parties (Competent Authorities and Industry) to discuss and improve the initial proposal, and eventually to make it acceptable.

To summarize, a long time was needed for this proposal (to include provisions in the IAEA Transport Regulations for a new group SCO-III of Surface Contaminated Objects (SCOs)) to be accepted. Starting from the initial need (to facilitate the safe transport of contaminated large objects), the road was long and winding, from the initial idea (a minor revision of the IAEA Transport Regulations to optimize the concept and / or wording of "Special Arrangement" to better cope with the current needs) to the final product (a major revision of the IAEA, with provisions for a new group SCO-III of Surface Contaminated Objects (SCOs) in the 2018 Edition of the "Regulations for the Safe Transport of Radioactive Material"), through the development of an Appendix VII "Guidance for transport of large components under special arrangement", for the "Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2012 Edition)". Key parameters for the acceptance of this proposal include:

- time to identify the appropriate angle to attack the problem and to get a mature proposal,
- involvement of all the interested parties from the beginning (prior to the formal proposal to the IAEA, and during the formal process through dedicated technical meetings, with a strong leadership of the proposer).

Consequences of including provisions for a new group SCO-III for Surface Contaminated Objects (SCOs)

As mentioned earlier, it is predicted that the demand to transport large objects from nuclear power plants and nuclear fuel cycle facilities for equipment replacement (to support extended operation), decommissioning, disposal or recycling will increase steadily. To transport this equipment under the Special Arrangement procedure would inevitably lead to difficulties, with the Competent Authorities due to different potential requirement and interpretation of how large objects can be transported, on the one hand, and with the public due to difficulties with understanding the concept of Special Arrangement.

It is expected that the provisions for a new group SCO-III for Surface Contaminated Objects (SCOs) in the 2018 Edition of the IAEA "Regulations for the Safe Transport of Radioactive Material", supplemented by updated guidance in the IAEA "Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material", and also by publications from the Industry such as the Fact Sheet "Transport of Unpackaged Surface Contaminated Large Objects" [6] from the World Nuclear Transport Institute (WNTI), enhance the understanding of how large objects can be transported amongst all stakeholders, including Competent Authorities and Industry, and also the public. Consequently, it is expected that this will facilitate these shipments and either support extended operation of nuclear power plants and nuclear fuel cycle facilities in the case of equipment replacement, and this will facilitate and

expedite the decommissioning of nuclear power plants and nuclear fuel cycle facilities in the case of shipment of equipment for recycling or disposal.

It should be noticed that the group SCO-III does not apply to objects which are both contaminated and activated, such are reactor vessels. This type of equipment will still have to be transported under Special Arrangement. This will remain a challenge in the future, despite the large experience gained by the Industry.

SHIPMENT AFTER STORAGE / AGEING MECHANISMS

Dual-purpose casks, i.e. casks to be used for storage and transport of radioactive material, particularly radioactive waste, represent a family of packaging which is more and more important. The transport of dual-purpose casks is a new challenge for the Industry and the Competent Authorities, particularly as regards transport after several decades of storage.

To deal with these issues, several initiatives were taken by the IAEA, such as the development of a TECDOC "Methodology for a Safety Case of a Dual Purpose Cask for Storage and Transport of Spent Fuel".

In addition, it was deemed necessary to update the IAEA Regulations for the Safe Transport of Radioactive Material, to cope with the specific issues regarding the transport of dual-purpose casks.

The first idea was to develop a new type of packages, specific to this family. However, it appeared rapidly that this was not appropriate, as the issues which emerged for this family of packages were – in fact – relevant to most packages. Therefore the 2018 Edition of the IAEA Transport Regulations was revised to include requirements for transport after storage, on the one hand, and requirements for considering ageing mechanisms and ageing management. For the sake of keeping this paper not too long, this example will not be developed extensively. The main lesson learned from this case is that it is an additional example where the primary idea (to develop a new type of package in the IAEA Transport Regulations) had to be completely revisited, to arrive to an end result (ageing mechanisms to be considered for all types of packages) far away from the primary idea.

PRESSURE DIFFERENTIAL FOR AIR TRANSPORT

Advisory material for the pressure differential for air transport

The IAEA Regulations for the Safe Transport of Radioactive Material requires that *packages containing radioactive material to be transported by air shall be capable of withstanding, without loss or dispersal of radioactive contents from the containment system, an internal pressure that produces a pressure differential of not less than maximum normal operating pressure plus 95 kPa*.

As regards the Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material relating to the 2018 Edition of the IAEA Transport Regulations, the latest draft available at the time of preparation of this paper (May 2019) states that *pressure reductions due to altitude will be encountered during flight (see para. 578.1). The pressure differential that occurs at an increased altitude should be taken into account in the packaging design. The pressure differential of 95 kPa plus the MNOP (see paras 229.1–229.3) is the pressure differential to be accommodated by the package design, without loss or dispersal of radioactive contents from the containment system. This design specification results from a consideration of aircraft depressurization at a maximum civil aviation flight altitude together with any pressure already inside the package, with a safety margin. In the case of solid material, to comply with para. 621, means other than pressure resistance may be used to demonstrate compliance. If it can be demonstrated that there is no loss or dispersal of the radioactive contents from the containment system when the package is exposed to the pressure differential expected during flight, the package design can be considered to meet the requirement even if the internal pressure is not maintained. The following information about pressure variations should be considered when evaluating the pressure differential:*

(a) In normal flight conditions, the decrease in pressure in the cabin and cargo compartments of a pressurized aircraft may reach 150 Pa/s (2500 ft/min) during climbing, and the increase in pressure may reach 90 Pa/s (1500 ft/min) during descent of the aircraft;

(b) Cargo-only aircraft may be designed and operated such that the cargo compartment is not pressurized during flight: for these types of aircraft the normal rate of pressure change experienced by the cargo is the actual rate associated with the climb and descent of the aircraft;

(c) In normal flight conditions, the pressure in the cabin and cargo compartments of an aircraft may decrease from the atmospheric pressure at sea level (about 100 kPa) to 75 kPa in a pressurized aircraft and to 25 kPa in a non-pressurized aircraft;

(d) In the event of an emergency, the pressure in the cabin and cargo compartments of a pressurized aircraft may drop suddenly to the pressure existing outside the aircraft (rapid decompression): in these emergency flight conditions it is considered that the cabin and cargo compartment pressure may drop linearly from a minimum normal equivalent altitude of 6000 ft, i.e. a maximum normal pressure of 81 kPa in cruise flight, to the standard ambient pressure of 15 kPa at 45000 ft altitude in a duration of 1 s.

Elements of history of the development of the advisory material for the pressure differential for air transport

The above-mentioned requirement for a package to withstand the specified pressure differential in case of air transport has raised questions by the Industry about its application. The key questions are: what is meant by "withstand"? what are the criteria?

Following discussions with the competent authorities, a proposal (WNTI/1.00/9) for revising the IAEA Transport Regulations was prepared by the World Nuclear Transport Institute (WNTI) in the framework of the SSR-6 2013 Review Cycle, which started at the end of 2012. The proposal included a significant modification of the requirement in the IAEA Transport Regulations, with a graded approach, depending of the type of package and of the physical state of the contents. Whilst there was recognition of the issue, the proposal appeared to be too complex, on the one hand, and the SSR-6 2013 Review Cycle did not lead to a revision of the IAEA Transport Regulations, on the other hand.

With the experience learnt during the SSR-6 2013 Review Cycle, WNTI modified and simplified its proposal for the review and revision cycle that started at the beginning of 2015. The new proposal was referenced by the IAEA as WNTI/2015/03. Meanwhile, new parties became involved in the process and additional material was needed to explain the issue. Then, a new hurdle appeared on the road towards the resolution of the issue, i.e. who should deal with this issue which is specific to one mode of transport: the IAEA, as the owner of the IAEA Transport Regulations for the Safe Transport of Radioactive Material (general multimodal regulations) or the International Civil Aviation Organization as the owner of the Technical Instructions for the Safe Transport of Dangerous Goods by Air (relevant modal regulations)?

After uncertainties, hesitations and discussions, it was eventually agreed that the ICAO should take the lead, and all the relevant parties (including the IAEA) be involved. Several dedicated meetings (formal and informal) were organized, sometimes with difficulties with gathering all the parties which have something to say at the same time in the same place, in all cases with new participants to educate about the issue, and subsequent additional comprehensive and detailed justifications to provide regarding the need for the modification.

The end result was that it was recognized that there was an issue, but that there was no need to revise neither the IAEA Transport Regulations, nor the ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air. The compromise was that ICAO should produce papers to present the issue to the national civil aviation authorities and to present the basic data for the guidance about the application of the regulations, on the one hand, and IAEA should complement its Advisory Material (SSG-26) with new guidance for the implementation of the regulatory requirements about pressure differential for packages to be transported by air

An ultimate difficulty was the delayed publication of the ICAO papers. This induced last minute modification of the guidance provided in the IAEA Advisory Material, in order to make it comprehensive, without the need for a reference to the ICAO papers.

After this long and difficult to predict process, new guidance for the implementation of the requirements about pressure differential for packages to be transported by air, should be available in the upcoming revision of the Advisory Material for the Safe Transport of Radioactive Material (SSG-26).

To summarize, a long time was needed for this change (developing new guidance for the implementation of the requirements about pressure differential for packages to be transported by air, for the upcoming revision of the Advisory Material for the Safe Transport of Radioactive Material (SSG-26)) to be accepted. Starting from the initial need (to clarify the requirement about the ability of a package to be transported by air to withstand the specified pressure differential), the road was long and winding, from the initial idea (a major rewriting of the IAEA Transport Regulations, with a complete rewriting of the requirements, including a graded approach, depending of the type of package and of the physical state of the contents) to the final product (new guidance for the implementation of the requirements about pressure differential for packages to be transported by air, in the upcoming revision of the Advisory Material). Key parameters for the acceptance of this proposal include:

- time
    - to develop comprehensive and detailed justifications regarding the need for the modification,
    - to identify the appropriate leading organization for a subject which is mode-specific,
    - to define the appropriate angle to attack the problem and to get a mature proposal,
- involvement of all the interested parties, prior to the formal proposal to the IAEA, and during – and also beside – the formal processes within IAEA and the modal organization, through dedicated technical meetings,
- flexibility to adapt in due course the proposal and the information to all the interested parties (including the changes in the interested parties).

Consequences of the new guidance for the pressure differential for air transport

New guidance for the implementation of the requirements about pressure differential for packages to be transported by air, should be available in the upcoming revision of the Advisory Material for the Safe Transport of Radioactive Material (SSG-26).

It is expected that this new guidance will contribute to eliminate misunderstanding of the regulatory requirement about the ability for a package to withstand the specified pressure differential in case of air transport. Therefore, it should avoid non-compliance with the IAEA Transport Regulations. In the opposite direction, it should avoid over-designed packages (and over-costly packages). It should also avoid the inability to carry out some transports, due to unavailability of packagings deemed to comply with the IAEA Transport Regulations.

CONCLUSION

Through the examples provided in this paper, lessons can be learnt by the Industry regarding the process for the review and revision of the IAEA Transport Regulations and the conditions to be met to gain acceptance of a proposal for a significant change of the IAEA "Regulations for the Safe Transport of Radioactive Material" and / or of the IAEA "Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material", its companion document.

Significant changes in the IAEA Transport Regulations (SSR-6) need a long time to be adopted. Several steps might be needed, i.e. a proposal may be rejected when issued for the first time, and then will need to be more developed, or a different approach might be needed.

In all instances robust technical background are needed to gain acceptance.

A key parameter is to identify all the interested parties. It must be remembered that modal organizations can be key players, and interfaces between the IAEA and the modal organizations have to be adequately managed.

At last, it is important to involve all the interested parties. This has to be done before the start of the IAEA process, to get the feedback of the other parties, and through dedicated technical meetings all along the IAEA process and in parallel of the IAEA process.

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