



Facilitation of the Safe and Secure Transport of Radioactive Material

White Paper

Findings of the IAEA Denial of Shipment Working Group 2023-2026

1. EXECUTIVE SUMMARY

The safe and secure transport of radioactive material is essential for the peaceful use of nuclear technologies, including life-saving medical applications, clean energy, industry, research, and agriculture. A comprehensive international regulatory framework is already in place and applies to all modes of transport—land, sea, and air. Nevertheless, persistent **delays in and denials of shipment (DoS)** of radioactive material continue to occur, even when consignments fully comply with international and national regulations. These disruptions undermine supply chains, increase costs, elevate safety and security risks, and—most critically—jeopardize patient healthcare through failed deliveries of time-sensitive medical radioactive material.

DoS manifests mainly in three forms: (1) intentional delays that may reduce material effectiveness, (2) refusals of individual consignments during transport, and (3) blanket policy decisions by carriers, ports, or airports not to accept radioactive material at all. While the overall scale of DoS is difficult to quantify due to limited reporting and industry confidentiality, there is broad consensus that the issue is recurring, systemic, and unlikely to be fully eliminated—though it can be significantly reduced.

Since 2003, the IAEA, its Member States and other stakeholders have taken sustained action to address DoS, including the establishment of the International Steering Committee on Denial of Shipment (2006–2013), followed by the Transport Facilitation Working Group (2014–2021). More recently, the **Denial of Shipment Working Group (DoS WG)** was established for 2023–2026 under successive IAEA General Conference resolutions. The DoS WG reviewed prior experience, analysed root causes and consequences, engaged stakeholders across transport modes, and developed a set of practical, forward-looking solutions.

The key **root causes** of DoS include negative perceptions of radioactive material and risk overestimation, awareness gaps regarding the societal benefits and time-critical nature of radioactive material (especially for nuclear medicine), regulatory complexity and lack of harmonization, insurance and economic barriers,

and operational decisions by carriers, ports, and airports. These drivers lead to **measurable consequences**, treatment, higher transport costs and societal inequities in access to healthcare, and increased risk of regulatory non-compliance.

To address these challenges, the DoS WG identified **eight core mitigating solutions**, centred on cooperation, transparency, capacity-building, and facilitation. A flagship recommendation is the development of a **Joint Statement on the Facilitation of Safe and Secure Transport of Radioactive Material (JS)**, led by interested Member States. The JS provides a high-level political commitment, reinforces confidence in existing safety frameworks, supports coordination and information-sharing, and strengthens the National Focal Point (NFP) network. NFPs are identified as a critical national mechanism to prevent, manage, and report DoS incidents, coordinate stakeholders, and support data collection and trend analysis.

Complementary solutions include: publishing national regulatory deviations and variations to improve predictability and planning; strengthening cooperation between the IAEA and UN Organizations such as ICAO, IMO and UNECE through joint statements, Memoranda of Understanding, and training; implementing targeted communication strategies to counter negative perceptions; enhancing regulatory capacities in States with limited infrastructure; prioritizing the transport of medical radioactive material for life-saving applications; and ensuring the continued availability of ports and airports capable of handling radioactive material in compliance with international regulations.

In conclusion, while DoS cannot be eliminated entirely, its frequency and impact can be substantially reduced through **political commitment, regulatory coherence, transparency, capacity-building, and sustained cooperation** among Member States, the IAEA, International Organizations, and industry. The DoS WG has fulfilled its mandate by delivering a coherent set of practical mitigating solutions. Future sustainable progress will depend on Member States' commitment and ownership of the issue, adequate resourcing at national level, IAEA and other UN Organizations for this work, strengthened national implementation mechanisms such as NFPs, and—if required—a renewed and specific mandate through a future IAEA General Conference resolution.

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3. INTRODUCTION

3.1 BACKGROUND

A robust international regulatory framework has been established for the safe and secure transport of radioactive material, and this applies to all modes of transport on land, sea and in the air. However, difficulties in the transport of radioactive material may occur, known as delay in and denial of shipment (DoS) of radioactive material DoS can be characterised in the following three forms:

Delay:

When an intentional delay adds journey time, which reduces the effectiveness of the radioactive material or renders the radioactive material unusable when delivered. A typical example could be radiopharmaceuticals, which have a very short half-life and achieving the scheduled delivery programme is essential, being slowed solely because they are radioactive material.

Denial:

i. when a consignment is not accepted at a point during the transport, even though the consignment complies with all regulatory requirements, including documentation. A typical example of this type of denial could be a pilot or ship captain refusing to take a consignment of radioactive material on board.

ii. when there is a policy decision not to accept radioactive material by one of the parties involved in a route, rendering the route unavailable. A typical example of this type of denial could be an airline, ocean liner or seaport deciding not to accept any radioactive material while accepting other dangerous goods.

Non-compliance with applicable regulations is outside the defined scope of DoS, although as explained in 6.1.2 (c) and 6.2.4, the root causes can inadvertently lead to non-compliance, or make compliance prohibitively difficult to achieve. Delays in or denials of shipment can affect *inter alia* the routes and modes of shipment, resulting in longer and more indirect routes potentially negatively affecting safety and/or security, the predictability of transport and delivery, and ultimately the provision of medical radioactive material (including life-saving nuclear medicine radiopharmaceuticals for diagnosis and treatment), among many other benefits of radioactive material.

3.1.1 Actions taken to address DoS from 2003 to 2018

The DoS issue was highlighted at the International Conference on the Safety of Transport of Radioactive Material held by the IAEA in 2003, and was subsequently addressed by the IAEA General Conference resolution GC(47)/RES/7 OP C-13 which read as follows:

- *Calls for discussions to address the problems with refusal of shipments.*

This resolution led the IAEA to conduct fact-finding exercises on DoS in 2004, followed by GC(48)/RES/10 OP C-12 which read as follows:

- *Welcomes the progress made on the problems related to refusals of shipments of radioactive materials (in particular for medical applications), and looks forward to a satisfactory resolution of this issue;*

Further progress was noted in 2005 and 2006 through GC(49)/RES/9 OP B-12 and GC(50)/RES/10 OP B-13, which stated:

- *Welcomes the progress made in conjunction with the International Federation of Air Line Pilots' Associations (IFALPA) on the problems related to refusals of air shipments of radioactive materials (in particular for medical applications), looks forward to a satisfactory resolution of this issue, encourages the Secretariat to continue addressing the denial of*

shipping issues, and welcomes the establishment of a steering committee to oversee the resolution of the problem;

In November 2006 the International Steering Committee on Denial of Shipment (ISC-DOS) was established, and it met eight times during 2006-2013, pursuing an Action Plan which led to the following outcomes:

- Definition of Denial of Shipment of Radioactive Material (including Delays);
- Establishment of National Focal Points;
- Regional Workshops;
- Regional Networks and Coordinators;
- Communication Strategy, with supporting materials;
- Handbook on DoS.

Subsequent GC resolutions noted the formation of the ISC-DOS, including the development of an Action Plan and a database on incidents of denials that was hosted by the IMO and urged the Secretariat to actively facilitate the Committee's work and implementation of the Action Plan. The database collected over 200 instances of delays and denials, mostly related to maritime transport of industrial sources and Naturally Occurring Radioactive Material, which was understood not to reflect the true nature of the issue, whether in terms of material or transport mode, as reporting instances of DoS required the time consuming compilation of extensive mandatory data, and depended on which operators had the time and inclination to populate the database. The data gathered informed two reports on the denial of shipment: by air, and by sea. Following several years of the database no longer receiving any reports, the maintenance was discontinued.

GC resolutions also encouraged Member States to assist and cooperate with the Committee and its work. They further noted the successful creation of regional action plans and networks to address key issues on denial of shipment, that resulted from the workshops held in Uruguay, Italy, Tanzania, Madagascar and China, and encouraged further regional workshops.

The resolutions also welcomed “*the progress made in conjunction with the International Federation of Air Line Pilots’ Associations (IFALPA) on the problems related to refusals of air shipments of radioactive materials (in particular for medical applications)*”¹, and looked forward to a satisfactory resolution of this issue, and in that context further called upon Member States to facilitate the transport of such radioactive material when carried in compliance with the Agency’s transport regulations.

In 2012 the ISC-DOS was tasked with resolving the DOS issue by 2013, and the final meeting of the ISC-DOS was held on 11-14 June 2013.

Following the ending of the ISC-DOS a multi-stakeholder group of experts from Member States, International Organizations and Industry, established together the Transport Facilitation Working Group (TFWG) in April 2014. This independent body provided a level of continuity for the work that had been done by the ISC-DOS, with a role to propose strategies and activities necessary to enable the efficient international transport of radioactive material.

Among the activities undertaken, the TFWG established a website (<http://tfwg.info>), organised side meetings at the IAEA GC, and carried out industry surveys that showed planning times had increased and that supply chains were fragile, often relying on very few carriers or routes; the effects of the 2020 pandemic further underlined the fragility of radioactive material transport. The TFWG also advocated for the reactivation of the National Focal Point (NFP) network by the IAEA, and it conducted an online webinar on 22-23 July 2021 to explain the roles and responsibilities of a NFP, which was well attended and included an address by the IAEA Director General Rafael Grossi.

¹ See IAEA General Conference resolutions GC(49)/RES/9 OP B-12 (2005), GC(50)/RES/10 OP B-13 (2006), GC(51)/RES/11 OP B-14 (2007), and GC(52)/RES/9 OP B-14 (2008).

From 2008 onwards, in parallel to the above, the nomination of NFPs was consistently called for by the IAEA General Conference Resolutions, and most recently GC(69)/RES/7 para. 95:

- *Calls upon Member States to facilitate the transport of radioactive material, and to appoint and inform the IAEA, if they have not done so, a national focal point on denials of shipment of radioactive materials to achieve a satisfactory and timely resolution of this issue;*

3.1.2 Actions taken to address DoS since 2019

After the ending of the ISC-DOS in 2013, the issue of DoS resumed significance, and was addressed in 2019 by the IAEA General Conference with Resolution GC(63)/RES/7 para. 81, and again in 2020 through a subsequent Resolution GC(64)/RES/9 para. 81:

- *Requests the Secretariat to hold a technical meeting to share experience and with a view to establishing a Working Group, with full participation of interested Member States and relevant experts, to consider the options for addressing denials of and delays in shipment, including a code of conduct on facilitation, and provide an initial report on these options to the Member States by June 2021;*

In response to this resolution, the IAEA held two virtual Technical Meetings:

- On Denial of Shipment — Issues and Solutions, from 23 to 26 March 2021; and
- On the Development of the Terms of Reference for the Denial of Shipment Working Group, 17 to 19 August 2021.

As an outcome of these meetings and in response to the subsequent IAEA GC Resolutions GC(65)/RES/8 para. 80 (2021) and GC(66)/RES/6 para. 87 (2022), which:

- *Welcomes the Agency's efforts to establish a Working Group, with full participation of interested Member States and relevant experts, to consider the options for addressing denials of and delays in shipment, including a code of conduct on facilitation;*

The Denial of Shipment Working Group (DoS WG) was established for a four-year period (2023–2026). This action was supported and reinforced in 2023 by the IAEA GC Resolution GC(67)/RES/8 para. 80:

- *Takes positive note of the work of the Working Group and the Secretariat on the issue of 'denials of shipment' in compliance with resolution GC(66)/RES/6 and requests the Secretariat to consider next steps on the draft Code of Conduct on the Facilitation of Safe and Secure Transport of Radioactive Materials that has been prepared by the Working Group;*

In response to the GC(67)/RES/8 resolution, the IAEA held an Open-Ended Meeting of Legal and Technical Experts on the Draft Code of Conduct on the Facilitation of the Safe and Secure Transport of Radioactive Material from 15 to 18 July 2024 to present the draft Code of Conduct prepared by the DoS Working Group and to seek further guidance from its Member States. The Member States' delegates attending the meeting were unable to achieve consensus on proceeding with the Code of Conduct, and instead recommended *i.a.* that:

- *Interested Member States should continue consultations on DoS;*
- *All Member States are encouraged to nominate NFPs and support the DoS WG;*

The continued work of the DoS WG was further supported by IAEA GC Resolutions GC(68)/RES/8 para. 97 and GC(69)/RES/7 para. 96, adopted in 2024 and 2025, respectively, and read as follows:

- *Takes note of the work of the Denial of Shipment Working Group in compliance with resolutions GC(68)/RES/8, and urges the Secretariat to assist interested Member States to*

develop concrete solutions to effectively address denials of shipment at the earliest, in order to overcome the sustained challenges in this regard;

Additionally, IAEA GC Resolutions GC(68)/RES/8 para. 98 and GC(69)/RES/7 para. 97:

- *Invites the Secretariat to continue working with the relevant UN specialized agencies, including the International Maritime Organization (IMO), the International Civil Aviation Organization (ICAO), and other relevant organizations such as the regional United Nations economic commissions to increase awareness and knowledge about the safe and secure transport of radioactive material;*

3.2 INTERPRETATION OF THE TEXT

Throughout this text, the use of the term International Organizations is intended to mean bodies in the United Nations system or other specialized agencies; where specific reference is made to United Nations bodies alone, this will be termed UN Organizations. In both cases this is not intended to include the IAEA, which will be referred to as the IAEA or the Secretariat as appropriate.

The term radioactive material is used to cover all types, both natural and anthropogenic, with short or long half-lives, raw materials, wastes, and for every application. A subset of this is radioactive material for a medical purpose, life-saving application, clinical use or for medical research, including radiopharmaceutical finished products for diagnostic/therapeutic purposes as well as medical radioisotopes that are used for the preparation of radiopharmaceuticals products; in this text this is collectively termed medical radioactive material.

4. THE DOS WG

4.1 MANDATE, OBJECTIVE AND TERMS OF REFERENCE

As detailed above, the DoS WG was established by the IAEA for the four-year period from 2023 to 2026, to consider and develop options for effectively addressing the issue of DoS.

Its mandate is grounded in multiple IAEA General Conference resolutions (GC(63)/RES/7 (2019), GC(64)/RES/9 (2020), GC(65)/RES/8 (2021), GC(66)/RES/6 (2022), GC(67)/RES/8 (2023), GC(68)/RES/8 (2024), GC(69)/RES/7 (2025))² and that set out objectives for the DoS Working Group to:

- Examine solutions to DoS, including a draft Code of Conduct on the Facilitation of the Safe and Secure Transport of Radioactive Material;
- Support IAEA efforts to identify and address sustained challenges causing DoS;
- Assist Member States in developing concrete solutions for DoS issues.

The Terms of Reference of the DoS WG are included in Annex 2.

4.2 PARTICIPATION

All Member States and International Organizations were invited to participate in the DoS WG through a note verbale of 30 June 2022. The DoS WG had 75 nominated participants, of which 52 were from national regulators.

A full participation list for each meeting is included in Annex 3.

² See also the original objective as approved by the DoS WG during its second meeting 24-28 July 2023.

All DoS WG meeting reports, as well as the Open-Ended Meeting of Legal and Technical Experts on the Draft Code of Conduct on the Facilitation of the Safe and Secure Transport of Radioactive Material report, were distributed to IAEA Member States by notes verbales.

5. GENERAL CONSIDERATIONS

5.1 GENERAL DISCUSSION

The DoS WG met six times from January 2023 to April 2026, and reviewed past experience, including the achievements and shortcomings of the ISC-DOS that met from 2006 to 2013, examined current knowledge, and identified gaps regarding the issue of DoS, including root causes and its effect on the transport of radioactive material and the ultimate users of the material.

The discussions focused on long term mitigation measures to address the issue of DoS, including facilitation of transport, leadership, strategic thinking, operational management, supervision, coordination and building relationships with a wide range of stakeholders.

Efforts made by International Organizations in the past to reduce the number or effect of denial of shipment were presented, using previous lessons learned, setting the scene for current efforts to address the issue of DoS. Examples included:

- The International Maritime Organization (IMO) adopting Resolution A.984(24) on the “Facilitation of the carriage of IMDG Code Class 7 radioactive materials including those in packaged form used in medical or public health applications of IMDG Code Class 7 radioactive materials including those in packaged form used in medical or public health applications.” and FAL.6/Circ.12 on Difficulties encountered in the shipment Class 7 radioactive material and, in particular, Cobalt-60. In addition, FAL Committee (34) in 2007 agreeing to insert a new appropriate entry in the Transport Document and/or Dangerous Goods Manifest (FAL Form 7) in order to confirm that the radioactive shipment concerned is to be used in medical or public health applications, having as intention to facilitate the identification of that material as such by the public authorities concerned;
- The International Civil Aviation Organization (ICAO) amending its modal regulations for the transport of dangerous goods, by including provisions “to facilitate and expedite the release and clearance of goods”, and that “States shall adopt regulations and procedures appropriate to flight operations and shall apply them in such a manner as to prevent unnecessary delays”, and for the prompt release and clearance of radioactive material for medical purposes being imported;
- The International Air Transport Association (IATA) has formally recognized the critical importance of radiopharmaceuticals in its Compassionate Transportation Manual (Chapter 8 — Send Shipments to the Flight), recommending that radioactive materials for medical purposes be accorded the highest priority for transport.

Stakeholder presentations were delivered to present examples of how DoS was occurring and the effects on the end users, to foster discussion and collect participants’ input.

The topics discussed focused on the practical consequences of DoS, and the mitigation measures to address the issue of DoS in the following areas:

- Supply of medical radioactive material
- Air transport of radioactive material
- Maritime transport of radioactive material
- Regional intermodal transport
- Awareness within domestic transport of radioactive material

The DoS WG sought to encourage participants to consider, present, and document mitigation measures to mitigate the issue of DoS, and so to facilitate the safe and secure transport of radioactive material. This includes aspects such as awareness raising, education, regulation, transport practices, and training needs.

5.2 OBSERVATIONS

Member States of the DoS WG have acknowledged that denial in and delay of radioactive material shipments is a genuine and recurring issue, though its scale remains difficult to quantify. Operators (consignors, carriers and consignees) and Member States have shared case studies highlighting instances where shipments were refused or delayed, resulting in disruptions to the safe and timely transport of radioactive material. To better understand the scope of the problem, surveys have been conducted to collect data on where these denials and delays are occurring and the underlying reasons, including regulatory restrictions, carrier refusals, and logistical challenges.

The surveys carried out by the DoS WG and presentations delivered by meeting participants, allowed for only a qualitative overview of the DoS issues. Consignors avoid most denials during planning, as they learn of systemic denials and can adjust planned routes accordingly. Examples of denials during transport are therefore fewer compared to the overall number of shipments, and the number of cases reported is not representative of the issue as a whole, as they do not account for systemic denials. However, for time sensitive (short half-life) goods such as radiopharmaceuticals even a delay during transport, which is much more common than a denial, can have significant consequences. For example, such delays reduce the number of patient doses or even render the material unusable with a direct negative impact on patients. There is also broad agreement that while DoS can have safety and security consequences, the primary consequences tend to be economic, other than the health impacts arising mainly in cases where the delayed or denied shipment involves critically time sensitive goods, such as radiopharmaceuticals.

There is a broad consensus that the problem of DoS can never be fully eliminated, even with all proposed measures. However, its likelihood and impact can be significantly reduced through appropriate mitigation strategies.

6. ROOT CAUSES AND CONSEQUENCES

DoS arises primarily from the relatively low volume of radioactive material compared to other dangerous goods, combined with the significant regulatory requirements that operators must meet. Additional challenges include the refusal of certain ports to accept radioactive material and the limited availability of essential resources, such as trained personnel, temporary storage facilities, and other necessary support functions.

The DoS WG first analysed the root causes identified by the ISC-DOS, and followed this up by preparing a number of surveys on the experience of DoS, which the IAEA circulated to:

- Member States;
- Industry Operators;
- Carriers.

The survey results and presentations from members of the DoS WG indicate that these factors collectively contribute to delays and denials in the transport of radioactive material. A summary of the survey results and DoS WG challenges in collection of data are included in Annex 4.

6.1 KEY ROOT CAUSES IDENTIFIED

6.1.1 Perception and Cultural Factors

- (a) Negative perceptions overestimating the risk, economics, or complexity of transporting radioactive material, and a lack of awareness of societal benefits, contribute to denials and delays.

6.1.2 Awareness Gaps

- (a) Delays processing shipments at borders or intermodal points are often caused by a lack of awareness of the time-critical nature of medical radioactive material.
- (b) There is a lack of understanding of the benefits of radioactive material for purposes including clean energy, sterilisation and other societally needed applications including medical radioactive material.
- (c) Lack of knowledge of the social importance of the work involved in the transport chain.

6.1.3 Regulatory Complexity, Lack of Harmonization and Administrative Gaps

- (a) Different and additional requirements between countries, and national deviations from international standards (e.g., SSR-6), create confusion and compliance challenges for consignors and carriers.
- (b) Lack of coordination of regulatory requirements within a country leads to contradictory or overlapping rules.
- (c) Regulatory inconsistencies, lack of harmonization, poor awareness of applicable regulations among relevant stakeholders and inadequate training all contribute to making it difficult for consignors and carriers to understand and comply with all requirements. Whilst non-compliance is outside the defined scope of DoS, the risk of negative consequences from non-compliance (such as fines and bad publicity) or the difficulty in ensuring compliance, can result in carriers choosing to withdraw from carrying or handling radioactive material, which does constitute denial.

6.1.4 Insurance and Economic Barriers

- (a) High insurance costs or inability to obtain insurance have led some carriers to stop accepting radioactive material.
- (b) Due to the complexity in regulations between neighbouring countries as noted above, carriers can be reluctant to transport radioactive material due to the difficulty of complying with all jurisdictions' requirements economically.

6.1.5 Carrier and Logistics Issues

- (a) Carriers sometimes refuse to carry radioactive material (including medical radioactive material) or deny previously agreed cargo, due to commercial decisions or last-minute changes, resulting in a lack of available carriers for radioactive material transport.
- (b) Limited availability of ports or airports which accept radioactive material, and restrictions on transit or transshipment, results in carriers refusing to accept radioactive material (including medical radioactive material).

6.2 MAIN CONSEQUENCES

6.2.1 Negative Impact on Patient Healthcare

- (a) Restrictions and delays reduce the availability of nuclear medicine for patient diagnosis or treatment, negatively impacting timely patient management and treatment effectiveness.

6.2.2 Increased Costs and Resource Use

- (a) Longer routes and the need to use chartered carriers result in higher costs and increased personnel requirements.
- (b) Increased cost of resources leading to increase of inequity and strain on social security systems (for example a lack of provision of nuclear medicine treatment in poorer or more remote communities).

6.2.3 Operational Delays lead to Safety or Security Risks

- (a) Additional storage and longer transport times increase the risk of transport safety and security related events,

- (b) Potential abandonment of cargo which cannot be delivered, would be both a safety and security risk.

6.2.4 Regulatory Non-Compliance Risks

- (a) Difficulty in understanding and meeting all regulatory requirements increases the risk of safety non-compliance.
- (b) Overlap in regulations and requirements normally leads to avoiding radioactive material transport by the carriers.

Delays in and denials of transport of radioactive material are driven by a combination of negative perceptions leading to an overestimation of the risk from the transport, regulatory complexity, administrative gaps, and logistical and economic barriers. These issues collectively lead to operational delays, increased costs, increased social inequity, potential safety and security risks, and negative impacts on multiple applications including clean energy supply and patient healthcare.

Furthermore, natural turnover among trained and experienced personnel across supply chains, including authorities and industry, combined with insufficient knowledge transfer, has reinforced the persistence of DoS as a recurring issue.

The Secretariat has communicated these root causes and observed consequences, at various international forums.

7. MITIGATION MEASURES RECOMMENDED

The DoS WG emphasized that strengthened cooperation, shared responsibility, and sustained political will are essential to advancing durable mitigation measures and ensuring that all Member States concerned contribute meaningfully to addressing the root causes. The group underscored that a sustainable and effective response requires the collective engagement of all Member States, including those involved in the use and development of nuclear technology, as well as those serving as transit States. The DoS WG has proposed the following mitigation measures, and the Secretariat has actively supported the group to implement some of the mitigation measures, noting that a combination of mitigation approaches is required to significantly reduce the likelihood and impact of DoS.

A diagram correlating root causes, consequences observed, and mitigation measures, is included in Annex 5.

7.1 JOINT STATEMENT ON THE FACILITATION OF THE SAFE AND SECURE TRANSPORT OF RADIOACTIVE MATERIAL

As an alternative to the Code of Conduct on the Facilitation of the Safe and Secure Transport of Radioactive Material (see section 3.1.2), a Joint Statement on the Facilitation of the Safe and Secure Transport of Radioactive Material (JS) was proposed to the DoS WG for consideration by France and Italy. The JS proposes a worldwide model of transparent cooperation to which States may commit themselves voluntarily.

7.1.1 Recommendation

The Group recommends interested Member States to support a voluntary **Joint Statement on the Facilitation of Safe and Secure Transport of Radioactive Material (JS)**. There is a need for high level political commitment from like-minded Member States to address the problem at various levels. France, Italy and a few other Member States along with support from a Non-Governmental Organisation (World

Nuclear Association) are coordinating the development of a JS to address the issue of DoS, and gain support at the Member State level.

7.1.2 General Advantages

- The JS raises the profile of the DoS issue in the international application of nuclear technologies, enhancing political attention, awareness, and resource mobilization among Member States, International Organizations, and stakeholders.
- The JS reaffirms the good safety and security record of transport of radioactive material carried out in compliance with the international regulations and reinforces the obligation of compliance with regulations applicable to radioactive material transport.
- The JS facilitates coordination about DoS among Member States and other stakeholders and supports the functioning of the NFP network.
- The JS encourages stakeholders to share information about DoS and identify solutions to tackle DoS.

7.1.3 Implications for Member States

Although legally non-binding, the JS implies a commitment from like-minded Member States. In practice, the JS can serve as an international normative benchmark to establish and maintain a national legislative and regulatory framework related to transport of radioactive material. Commitment to the JS implies that the Member States' legislators and regulators are encouraged to ensure consistency of national law with the principles of the JS (safety, security, and responsibility).

Commitment to the JS enhances international cooperation among Member States and the credibility of the Member State in consideration of nuclear applications, including health care and clean energy supply.

The JS strengthens international trust and confidence-building among Member States that have expressed commitment as it constitutes an international reference for radioactive material transport facilitation. It encourages other Member States to commit to the JS for radioactive material transport facilitation.

7.1.4 Implications for the Secretariat

While the JS is a Member State initiative in its format and content, subject to a request by a Member State, the Secretariat would circulate the JS among the IAEA Member States via an INFCIRC and make it available on the relevant IAEA webpage. Other Member States could subscribe to the JS at a later date.

The JS informs the Secretariat of the voluntary commitments by signatory Member States regarding the facilitation of safe and secure transport of radioactive material.

7.1.5 Implications for International Organizations

The JS is intended to strengthen the leadership role of International Organizations in supporting Member State actions resulting from the JS.

7.1.6 Implications for Operators

In Member States that support the JS, the JS would:

- Constitute a tool to support the various exchanges with authorities.

- Enhance the availability of national logistics infrastructures (seaports, airports) for import, export, transshipment and transit of radioactive material.
- Enhance the dialogue between operators (consignors, carriers, consignees) and authorities regarding radioactive material transport facilitation.

7.1.7 Remaining gaps and challenges

- Difficulty for stakeholders to escalate DoS incidents to policy makers.
- Resource challenges amongst regulators.
- Exchanging confidential commercial information could be a challenge.
- Some regulators may not be notified of delays and denials, as industry focuses on work-around solutions.
- Regulators often do not have the authority to require port authorities, or carriers to transport radioactive material.

7.2 NATIONAL FOCAL POINTS

The concept of a National Focal Point for Denial of Shipment of Radioactive Material (NFP) was first developed by the ISC-DOS and has been supported by the IAEA General Conference resolutions since 2008 and was further advocated for by the TFWG during 2014-2021. The introduction of NFPs is a mitigation measure that can address the issue of DoS in their country.

The DoS WG recognized that the transport of radioactive material involves multiple stakeholders and competent authorities, as well as additional control frameworks, including import and export requirements, transit policies, insurance and liability provisions, routing considerations, and modal transport restrictions. In this context, the NFP is a key element of an effective and coordinated approach. The DoS WG noted that such a mechanism had proven useful in the implementation of previous relevant resolutions regarding NFPs, including GC(52)/RES/9 OP B-14 (2008) and subsequent resolutions, which stated i.a.:

- *“...calls upon Member States to each nominate a national focal point for denials of shipment of radioactive material...”*

and also GC(54)/RES/7 OP 42 (2010) and similar resolutions, which stated i.a.:

- *“...welcomes the creation of regional action plans and networks to address key issues...”*

A NFP would facilitate a clear and comprehensive understanding of national regulatory requirements for consignors and other stakeholders, and would support the timely resolution of any challenges encountered during the planning and execution of international shipments.

The role and key responsibilities of NFPs, as approved by the DoS WG during its meeting on 24-28 July 2023 and subsequently listed in a note verbale circulated on 16 January 2024, are grouped as follows:

1. SUPPORT

- Support the management of a national network of all interested parties and share information;
- Discuss with relevant interested parties any occurrence of DoS in order to facilitate a solution;
- Establish an action plan with relevant interested parties;
- Coordinate and facilitate solutions using a network of experts.

2. PREVENT

- Prepare proposals for possible improvements to mitigate the issue of DoS;
- Identify and communicate lessons learnt and share information;

- Collect DoS information for their Member State and provide this to the IAEA.

3. REPORT

- Provide feedback to the national network, and for each occurrence to the relevant interested parties;
- Report annually to their national network, the national authority and the IAEA.

The above points set out a common understanding for the NFPs in fulfilling their role and responsibilities. Training workshops can provide the knowledge and tools for a successful design and implementation of a national action plan, stakeholder network and actions to facilitate solutions to DoS. Workshop participants would be existing NFPs or their delegates, coming from governmental bodies, regulatory bodies, technical support organizations, and other organizations, who have an interest in the transport of radioactive material.

7.2.1 Recommendation

The Group recommends the maintenance of a sustainable **network of NFPs, either by the IAEA for all Member States, Industry, or by interested Member States as envisaged by the JS.**

7.2.2 General Advantages

Establishing and maintaining a NFP network for denial and delay of radioactive material shipments creates a single, accountable forum for coordination across government, regulators, operators, IAEA and International Organizations. The advantages of having an appointed NFP network include:

- **Faster issue resolution and continuity of operations.** More direct NFP–industry communication links can shorten response times when bottlenecks arise and enable pragmatic work-arounds to keep medical radioactive material flows moving.
- **Shared learning and peer support.** Formal workshops and working groups can: create or bolster Regional NFP Networks; train NFPs on roles, responsibilities, and allow for peer exchanges of best practices; and identify working solutions and common pitfalls.
- **Visibility of Member State regulatory deviations and variations.** An NFP network will support collection and publication of Member State deviations and variations from SSR-6 and modal regulations, and additional requirements from other entities e.g. customs and (air)port authorities; enabling consignors/carriers to plan compliant routings and prevent avoidable denials.

7.2.3 Implications for Member States

- **Funding.** The role of NFPs in Member States will need to be adequately funded to enable them to fulfil their duties, particularly the requirement to network both within their state with operators and regulators and internationally with regional networks of NFPs.
- **Capability building and resilience.** Member States that appoint active NFPs gain local expertise and a rapid escalation path for cross-border shipment issues; participation in IAEA DoS WG workshops and other NFP networking opportunities within global or regional networks will strengthen operator capacity.
- **Practical outcomes for health systems.** Timely NFP action can reduce risks to the availability of critical medical radioactive material by smoothing international logistics and helping to prioritise regulatory consents where public-health consequences are concerned.

- **Cross-border cooperation.** Routine, informal contact between neighbouring Member State NFPs should enable quick, low-friction solutions without formal bilateral processes.
- **Targeted prioritisation of consents.** Where regulatory approval times risk interruption of critical radioactive material flows, NFPs could help frame the public-interest case for timely consideration without seeking waivers—maintaining regulatory integrity while mitigating system risk.
- **Constructive engagement with operators.** NFPs can channel operator feedback to regulators (e.g., effects of border checks, modal practices or experience in engaging the NFP network), documenting lessons learned for recurrence prevention and enabling proportionate, risk-informed oversight that still safeguards public safety.
- **Validated data collection of extent of DoS.** Through a coordinated collection of data on DoS at the national level validated by NFPs, Member States can gain a clearer understanding of the scale and effect of DoS in their country and share this with relevant stakeholders.

7.2.4 Implications for the Secretariat

- **Role clarity and training delivery.** IAEA and/or an alternative organization should continue to convene NFP workshops that train NFPs on roles/responsibilities, peer learning, and best practice exchange, reinforcing a common understanding.
- **DoS WG stewardship and legacy.** The DoS WG promotes sustainable outcomes: maintaining an NFP contact list, encouraging NFP succession, providing handbooks/templates, and insofar as possible supporting Member State efforts to have deviations and variations published. A critical component of this stewardship is the systematic collation of NFP annual reports, and dissemination among involved parties of relevant non-confidential information, with the purpose of providing insight into trends and recurring challenges in radioactive material transport supply chains. Fulfilling these functions will require sufficient resources for the Secretariat (or any other organisation in charge of this data collection and sharing), to maintain the DoS WG's legacy and effective oversight in the years ahead.

7.2.5 Implications for International Organizations

Increased cooperation among International Organizations and the IAEA. There will be an ongoing requirement for cooperation among International Organizations and the IAEA to minimise issues of DoS in all modes by addressing issues and providing mode specific joint training to key stakeholders in the transport supply chain (e.g. port authorities, pilots, vessel owners and charterers, cargo handlers, etc.) as well as more forms of online training such as webinars and e-learning modules.

7.2.6 Implications for Operators

- **Predictability and route optimisation.** Access to NFPs and the shared catalogue of Member State deviations and variations when collated, will assist consignors and carriers in the planning of routes (including alternative ports or packaging configurations) and pre-empt refusal points.
- **Rapid troubleshooting and support.** When denials/delays occur, NFPs are a single point of contact to provide advice to all parties and thereby accelerate resolution.
- **Clear communication channels.** Guidance and presentations produced through the NFP function (e.g., industry briefings) can clarify what operators can do to help NFPs and what support is available from NFPs.

- **Communication on denials.** Operators (Consignors, Carriers and Consignees) should notify instances of denial or delay to the NFP both for assistance and to enable the NFP to record the incident to support data collection and analysis and onward reporting to the Member State Policy Makers.

7.2.7 Remaining gaps and challenges

- **Incomplete NFP network.** Keeping the global NFP list current and publicly available remains a recurring task for the organization responsible for maintaining this.
- **Variable NFP engagement.** In some cases NFPs are not as responsive as required to requests for help from operators and this may be reflected in counterpart NFP annual reports prepared in consultation with relevant stakeholders.
- **Ambiguity on reporting and feedback loops.** While templates for NFP annual reporting are being developed, clarity is still needed on how reports will be used and the feedback NFPs can expect—otherwise reporting can feel one-way and not productive.
- **Draft policy instruments and support materials not yet finalised.** Text for the NFP handbook has circulated but needs to be finalised and made more generally available.
- **Lack of Funding.** The DoS WG has identified ongoing activities which will be required to keep the NFP networks functional and need to be coordinated by an appropriate organization or group of interested Member States. The organization or group's activities in fulfilling these functions will be commensurate with the funding available. Without sufficient funding, this could potentially lead to a decline in NFP activity as happened after the International Steering Committee on Denial of Shipment was ended in 2013.
- **Lack of Notification.** The NFP may potentially not be notified of instances of DoS leading to a lack of awareness and reporting to Member States Policy Makers and the IAEA.

7.2.8 Actions Required

- **Formalise NFP role guidance and reporting.** Appropriate organization to finalise the NFP handbook and an annual NFP report template; set out clearly how it will use these reports and provide feedback to NFPs.
- **Maintain and promote the global NFP directory.** Appropriate organization to continue keeping the NFP list current and accessible to stakeholders.
- **Institutionalise peer training and regional meetings.** Appropriate organization to build on existing NFP workshops, with additional virtual/physical sessions for regional NFP Networks to sustain momentum and share updates.
- **Funding.** Member States and operators to ensure the appropriate organization is adequately resourced to support these activities.

7.3 NATIONAL REGULATORY DEVIATIONS AND VARIATIONS

The lack of harmonisation is one of the recognized root causes by the DoS WG. A publicly available collection of deviations and variations to SSR-6 and modal regulations, with additional national regulations and requirements (by customs, local or (air)port authorities etc.) relevant to transport of radioactive material, would highlight the existing regulatory differences to all relevant stakeholders. It could serve as a foundation to facilitate the planning of transports and the harmonization of regulations among states.

7.3.1 Recommendation

The DoS WG recommends **Member States to establish and maintain a publicly accessible list of national regulatory deviations and variations** (as referred to in points (a) to (c) in Annex-I of SSR-6, and in para 2.5 of Annex 18 to the Convention on International Civil Aviation), to assist involved parties.

7.3.2 General Advantages

A publicly available list would offer information to every stakeholder involved in transport operations. Deviation and variation lists from different Member States or a single combined list would offer easier planning for both domestic and international transport.

7.3.3 Implications for Member States

- Legislators and regulators should collect the deviations and variations and publish a list for their Member State. The compilation of this list should be reviewed regularly by the Member State.
- Additionally, the NFP or relevant authority, may maintain a country specific page on FASTRAM (part of the IAEA GNSSN) for the recording of deviations (as referred to in points (a) to (c) in Annex-I of SSR-6).
- Alternatively, provided an appropriate mandate from Member States has been provided to the IAEA (see Actions Required below), a list of deviations should be sent to the Secretariat to enable sharing a comprehensive list of such deviations worldwide. Member States should also ensure sufficient resources for the IAEA to fulfil this task.
- Separately, provided an appropriate mandate from Member States has been provided to the IMO (see Actions Required below), a list of deviations or variations should be sent to the IMO to enable sharing a comprehensive list of such deviations or variations worldwide. Member States should also ensure sufficient funds for the IMO to fulfil this task.
- The lists can help legislators and regulators identify potential areas for harmonization.

7.3.4 Implications for the Secretariat

If an appropriate mandate is provided as mentioned above, the Secretariat should consolidate national lists submitted by Member States into a single list and publish it on the FASTRAM webpage. The Secretariat should periodically request Member States to ensure their list of national deviations is up to date.

7.3.5 Implications for International Organizations

Updating state deviation/variation list in international transport regulations applicable to the relevant mode of transport concerned is required. While the ICAO already performs this function, the IMO requires an appropriate mandate from the IMO Member States for this action.

7.3.6 Implications for Operators

Operators (Consignors, Carriers and Consignees) would be able to access a comprehensive list of various requirements in different Member States. This list could help simplify transport planning and identify potential problems at an early stage.

The list would assist stakeholders to detect regulatory deviations and variations in the Member State that will impact operations and enable them to initiate mechanisms to interact with regulators to minimize or

prevent disruptions. Stakeholders should notify to the NFP and relevant organization any unlisted deviations and variations to ensure the list is as complete as possible.

7.3.7 Remaining gaps and challenges

- The collection of deviations and variations will never be exhaustive. The collection within the member state can only cover part of the national legislation, so there may be other areas that can still have an impact on transport.
- Additional rules set by ports, carriers, insurances etc. will not be part of the list.

7.3.8 Actions Required

DoS WG members to brief their authorities on the recommendations of the DoS WG, including the collation and publication of Member State deviations and variations (as referred to in points (a) to (c) in Annex-I of SSR-6, and in para 2.5 of Annex 18 to the Convention on International Civil Aviation), to support operators. In addition:

- Member States are encouraged, via the IAEA General Conference resolution, to provide the Secretariat with the necessary mandate to publish deviations (as referred to in points (a) to (c) in Annex-I of SSR-6) as well as sufficient funds for the IAEA to fulfil this task.
- Member States are also encouraged, via an appropriate process, to provide the IMO with the necessary mandate to publish deviations or variations from the IMDG Code.

7.4 COOPERATION WITH INTERNATIONAL ORGANIZATIONS

The DoS WG observed that the root causes identified are primarily linked to carriers, airport, and port authorities. In response, the Secretariat is strengthening collaboration with sister organizations by invitation to DoS WG meetings, building on the IAEA–ICAO Joint Statement to enhance cooperation on transport of vital radioactive material, and drafting an IAEA–ICAO Memorandum of Understanding (MOU) that will set the framework for mutual cooperation in the areas of safe and secure transport of radioactive material. A similar joint statement and MOU could be developed with IMO. Currently planned initiatives of the IAEA, include hosting a joint webinar with ICAO in 2026 for stakeholders such as airport authorities, airlines, and pilots; as well as jointly developing e-learning material on the safe maritime transport of radioactive material, currently in progress with IMO.

Enhanced cooperation with International Organizations will:

- Create a unified and authoritative voice on transport regulations across all international transport modes.
- Improve global consistency in applying the SSR-6 requirements and the corresponding UN Model Regulations (Orange Book), UNECE regional agreements (ADR, RID, ADN), ICAO Technical Instructions and IMO IMDG Code.
- Support consideration of security requirements.
- Lead to formal MOUs that will enable predictable long-term collaboration rather than ad-hoc engagement.
- Reduce fragmentation between nuclear regulators, aviation authorities, maritime regulators, and operators.

Joint webinars between IAEA and UN Organizations will:

- Provide direct outreach to operators particularly of time-critical medical radioactive material.
- Reduce the misunderstanding of radioactive material and their risk profiles.
- Encourage broader industry participation in resolving denials/delays.
- Improve consistency across global aviation networks, reducing variability between airports and carriers.

7.4.1 Recommendation

The DoS WG recommends **International Organizations to increase cooperation on the facilitation of the safe and secure transport of radioactive material.**

7.4.2 General Advantages

Strengthened cooperation among the IAEA and International Organizations has broad consequences for the global framework governing the safe and secure transport of radioactive material. As the root causes of denial and delay frequently stem from carriers, airports, and port authorities, enhanced collaboration directly targets the actors most able to reduce operational disruptions. By inviting sister organizations to participate in DoS WG meetings, the Secretariat is advancing a more cohesive international approach. Future joint actions—such as formal MOUs and shared training resources—are expected to improve regulatory harmonization, streamline incident response, and foster common standards across all transport modes.

7.4.3 Implications for Member States

Legislators and regulators stand to benefit from a clearer, more integrated set of expectations across transport modes. Regulators will also have improved access to harmonized training, consistent messaging among UN Organizations regarding the facilitation of safe and secure transport of radioactive material, and consistent frameworks for addressing denials or delays. The coordinated involvement of UN Organizations ensures that regulatory guidance reflects the realities of how airports, carriers, pilots, and port authorities operate.

7.4.4 Implications for International Organizations

For the IAEA, deepening cooperation with ICAO, IMO, UNECE and other UN Organizations enhances its ability to address cross-sectoral transport challenges. The IAEA–ICAO Joint Statement marks a major step toward integrated regulation and communication in air transport, including the key area of working towards the reduction of denials of, and delays in, shipment of radioactive material by air, and the drafting of a dedicated IAEA–ICAO MOU further formalizes cooperation in safe and secure transport oversight.

Expanding this model to include the IMO would unify maritime and aviation approaches, enabling more efficient communication channels, harmonized regulatory interpretations, and co-developed training programmes. Such partnerships solidify the IAEA's role as the coordinator for the safe and secure transport of radioactive material across all modes, while also reducing gaps between modal regulators and aligning global transport practices.

Through initiatives, International Organisations (IGOs, NGOs) can bring interested stakeholders together for coordinated and targeted efforts to reduce the incidence of delays and denials of shipment. Where appropriate, such initiatives should include governance by the IAEA, Member States, and Industry representatives.

7.4.5 Implications for Operators

Strengthened cooperation among International Organizations directly targets the groups most frequently implicated in denials and delays: carriers, airports, and port authorities. By involving ICAO, IMO, and other organizations more closely in the activities arising from the proposed solutions outlined in this document, carriers can expect clearer operational guidance, better-aligned safety expectations, and more accessible training.

For consignors and consignees, these initiatives should reduce the uncertainty associated with cross-modal transport, particularly where misunderstandings or unfamiliarity with radioactive material requirements previously led to refusals. Joint training (e.g., IAEA-ICAO webinars) and e-learning modules will ensure that personnel across the transport supply chain apply consistent practices, reducing costly disruptions and facilitating more predictable delivery times.

7.4.6 Remaining gaps and challenges

Despite progress, gaps remain:

- Current cooperation between the IAEA and modal organizations is asymmetric, with more developed cooperation on the aviation side (ICAO) than maritime (IMO).
- Root causes linked to carriers and port/airport authorities reflect operational misunderstandings, which cannot be fully addressed by regulators alone.
- Training and outreach materials are not yet standardized across modes or globally disseminated.
- Engagement with UN Organizations is still initiative-based, not fully institutionalized; MOUs are in development but not yet executed or widely implemented.
- Addressing these gaps requires sustained effort, structured agreements, and targeted training.

7.4.7 Actions Required

- The IAEA and ICAO to finalise and implement the IAEA–ICAO MOU, establishing long-term mechanisms for joint problem-solving, data sharing, and mutual training.
- The IAEA and IMO to develop an IAEA–IMO Joint Statement and MOU, ensuring maritime transport receives the same level of structured cooperation as for aviation.
- The IAEA to expand joint capacity-building, including:
 - Joint webinars with International Organizations for various target audiences,
 - E-learning modules in cooperation with ICAO, IMO, and UNECE.
- Relevant UN Organizations to strengthen communication channels to carriers, airports, and port authorities using unified guidance stemming from joint UN Organization efforts.
- International Organizations to monitor and evaluate inter-organizational collaboration on DoS during their periodic review meetings.

7.5 COMMUNICATION STRATEGY

The persistence of DoS highlights the critical importance of sustained, structured, and multi-level outreach.

Most of the root causes of denials and delays in the transport of radioactive material can be directly or indirectly related with topics like awareness gaps and a general negative perception about radioactive material applications (nuclear applications). To help address this negative perception, the DoS WG developed a Communication Strategy intended primarily for use by the NFPs, as well as other relevant stakeholders involved in the transport of radioactive material.

The Secretariat has published webpages on the Facilitation of Transport of Radioactive Material (FASTRAM <https://gnssn.iaea.org/main/fastram/Pages/default.aspx>) in cooperation with the DoS WG.

7.5.1 Recommendation

The DoS WG recommends for Member States, Operators and International Organizations to **maintain outreach at all levels including development of Communication Strategies** with reference to the **Communication Strategy** developed by the DoS WG; and take actions to improve the perception of radioactive material, including by raising awareness of the importance of timely transport of critical medical radioactive material.

The Group recommends **maintaining the webpages on Facilitation of Transport of Radioactive Material** (FASTRAM <https://gnssn.iaea.org/main/fastram/Pages/default.aspx>).

7.5.2 General Advantages

Outreach in this context applies to a variety of stakeholder categories, which for various reasons can have a negative perception and feedback about the transport of radioactive material:

- Policymakers;
- Public administrations involved in transport of radioactive material (e.g. regulators, customs, police officers);
- Current and future potential operators working with radioactive material;
- Insurers;
- General public.

Given the variety of stakeholders, in terms of role, knowledge of the topic, potential to cause DoS and personal sensitivity, the identification of the target audiences is a fundamental pre-requisite to implement an efficient outreach about the transport of radioactive material.

For each type of target audience, different aspects should be considered and developed:

- The topics to focus on;
- The messages to be conveyed;
- The communication tools to be used (brochures, journal articles, presentations, videos, speeches);
- The communication channels to be used (public events, conferences, webinars), either specifically dedicated to radioactive material applications or more general in scope.

The identification of the target audience, as well as the approach to be adopted for each of them should be included in an outreach programme.

Moreover, a structured evaluation mechanism to assess the effectiveness of communication tools and channels in reducing DoS is needed.

Successful operation and maintenance of the relevant webpages will require frequent monitoring and updating, utilising such input of revised materials and data as provided by Member States and other stakeholders. Member States will need to provide sufficient, continuing, resources for those responsible for the webpages to meet this task.

Responsible authorities will also require the continued support from other stakeholders, such as NFPs, International Organizations and Operators, to review and update webpage resources. This will require coordination and resources.

7.5.3 Implications for Member States

For legislators and regulators, the persistence of the mistrust concerning the transport of radioactive material underscores the need to contribute to improve awareness and communication related with transport, both to

the public and inside the public entities themselves. Policymakers and public administrations involved in radioactive material transport, including customs authorities, police officers, and inspection bodies, should have a clear and accurate understanding of radioactive material applications and transport safety requirements. Targeted outreach and training can help ensure that regulatory actions are proportionate, risk-informed, and consistent with national and international obligations.

Moreover, legislators and regulators should cooperate with the NFP (where nominated) for the implementation of the outreach programme and contribute raising public confidence about the transport of radioactive material and, more generally, about the importance of radioactive material applications.

Furthermore, legislators and regulators may participate in joint outreach initiatives coordinated at national or international levels.

The webpages on Facilitation of Transport of Radioactive Material provides a trusted source of up-to-date relevant information for the various users, including legislators and regulators when addressing the issue of delays and denials of shipment of radioactive material. By providing clear and concise information the damaging consequences caused by delays and denials of shipment will be better understood by the audience.

Provision of resources to support NFPs and other stakeholders with an interest in overcoming the difficulties experienced will help coordinate their efforts in overcoming the challenges caused by delay and denial of shipment.

Keeping the webpages up to date with revised information will increase audience experience and help to build trust of the webpages and Member State involvement.

To benefit from the resources available on the website, legislators and regulators should utilise the webpages regularly.

Member States should periodically provide responsible authorities with relevant information to ensure the webpages resources are kept up to date.

7.5.4 Implications for International Organizations and the IAEA

International Organizations and the IAEA have a key role in coordinating and promoting harmonized outreach efforts across borders. Given the transnational nature of radioactive material transport, these organizations are well placed to develop guidance and model communication strategies tailored to different stakeholder groups. They can facilitate information exchange and promote consistent messaging that reinforces the safety, security, necessity, and regulatory robustness of transport of radioactive material. Furthermore, International Organizations and the IAEA can act as neutral platforms to engage policymakers, regulators, and industry representatives, helping to counter misinformation and align outreach programmes with international safety standards and conventions.

The webpages provide useful resources for International Organizations and the IAEA when understanding the challenges with delays in and denials of shipment of radioactive material.

The webpages will, in parts, benefit from regular review and input from International Organizations and the IAEA. Ongoing commitment from those International Organizations and the IAEA will be essential to ensure this input has lasting impact.

7.5.5 Implications for Operators

Operators (consignors, carriers, and consignees) are directly affected by DoS and therefore have a strong incentive to engage proactively in outreach activities. It implies that operators working with radioactive material should not only comply with technical and regulatory requirements but also contribute to communication efforts aimed at other stakeholders, including other operators who could potentially work

with radioactive material (e.g. airline companies, maritime companies, couriers). This includes sharing accurate information on safety practices, emergency preparedness, and the societal benefits of radioactive material applications. DoS should be maintained as a topic at relevant international events and conferences. Moreover, operators should cooperate with relevant NFPs for the implementation of outreach programmes. Furthermore, operators may participate in joint outreach initiatives coordinated at national or international levels.

The webpages provide resources that can be utilised by operators to understand the issues and challenges caused by delays and denials of shipment of radioactive material. These materials can also be used to educate at all levels within stakeholder organizations.

To benefit from the resources available on the webpages, operators should regularly utilise the webpages.

Operators should periodically provide the Secretariat with relevant information to ensure the webpage resources are kept up to date.

7.5.6 Remaining gaps and challenges

Despite the recognition of outreach as a key mitigation measure, gaps could arise in the systematic identification of target audiences and the consistent implementation of tailored communication strategies.

Moreover, it should be taken into account that outreach efforts are often fragmented, non-uniform across regions or focused on limited stakeholder groups.

Additionally, the general public and non-specialized operators are frequently under-addressed, even though their perceptions can indirectly influence transport decisions.

Moreover, Member States that have not nominated a National Focal Point may miss the necessary elements for the implementation of the communication strategy and the coordination with other Member States, the IAEA and International Organizations for a coordinated outreach approach.

Member States will need to provide necessary funding to the Secretariat to support the maintenance of the webpages.

All stakeholders should be encouraged to use, and contribute to, the webpages content.

7.6 ENHANCING REGULATORY CAPACITY, PARTICULARLY IN MEMBER STATES WITH NO OR LIMITED INFRASTRUCTURE FOR OVERSEEING THE TRANSPORT OF RADIOACTIVE MATERIAL

The safe and secure transport of radioactive material is essential to the effective use of such material in medicine, industry, food and agriculture, research, and energy, and to the integrity of the global nuclear safety and security framework. Significant disparities remain among the IAEA Member States in regulatory capacity, particularly in Member States with no or limited infrastructure for overseeing the transport of radioactive material. In this context, it is of critical importance that actions continue to enhance the capacity of these Member States.

7.6.1 Recommendation

The DoS WG recommends the Secretariat to continue its efforts to enhance the capacity of Member States that have no or limited regulatory infrastructure for the safe and secure transport of radioactive material.

7.6.2 General Advantages

Strengthening national regulatory capacity contributes directly to improved global safety and security by reducing the risk of incidents or accidents, loss of control, and malicious acts during transport. It also promotes harmonization with the IAEA Safety Standards and Nuclear Security Guidance, facilitating cross-border transport and enhancing public confidence. Robust regulatory systems support sustainable national programmes and enable Member States to fully benefit from the peaceful uses of radioactive material.

7.6.3 Implications for Member States

Legislators and regulatory authorities in beneficiary Member States face the need to establish or strengthen legal and regulatory frameworks, build institutional and human capacity, and improve inter-agency coordination. Adoption of international standards must be balanced with national circumstances, while maintaining effective enforcement and oversight.

7.6.4 Implications for the Secretariat

The Secretariat should continue to enhance the Member States' regulatory capacity, particularly in Member States with no or limited infrastructure for overseeing the transport of radioactive material.

7.6.5 Implications for International Organizations

International organizations should continue providing technical assistance where required, increasing coordination with regional and international partners, and utilising effective monitoring and evaluation mechanisms to ensure long-term impact. Adequate resourcing and knowledge management is also essential to address growing demand for capacity-building support.

7.6.6 Implications for Operators

Operators (consignors, carriers, and consignees) may encounter enhanced regulatory requirements, including licensing, training, and documentation. While this may entail initial costs, clearer and more harmonized regulations improve operational predictability, reduce transport disruptions, and foster a stronger safety and security culture across the transport supply chain.

7.6.7 Remaining gaps and challenges

Key challenges to effective implementation of enhancing national capacity include limited national ownership of critical infrastructures, human resource constraints, training of operators and regulators, fragmented legal frameworks, insufficient infrastructure, financial limitations, and uneven integration of security considerations. Addressing these gaps requires a comprehensive and sustained approach that combines legislative, institutional, technical, and human capacity development.

7.7 FACILITATING THE SAFE AND SECURE TRANSPORT OF MEDICAL RADIOACTIVE MATERIAL

The transport of time-sensitive medical radioactive material is critically susceptible to transport disruptions, with delays resulting in loss of material effectiveness, delays that potentially lead to the medical radioactive material becoming unusable and equivalent to denial. This can be attributed to a lack of awareness of the material's benefits in healthcare, a negative perception of radioactive material leading to an overestimation

of the risk of transport, and reluctance by carriers to accept the material for transport. To address these specific issues, the transport of medical radioactive material to the end users should be facilitated to enable optimisation and prioritised delivery. The group identified that facilitation of this type could utilise a specific UN classification for materials/packages and/or specific IATA Special Handling Codes.

7.7.1 Recommendation

The DoS WG recommends **facilitating the transport of medical radioactive material** by Member States submitting proposals for change to the UN classification for materials/packages to TRANSSC along with justification.

The Group recommends **facilitating the transport of medical radioactive material** by Operators submitting proposals for change to specific IATA Special Handling Codes to IATA along with justification.

7.7.2 General Advantages

- Improved logistics and timely access to critical medical radioactive material, for urgent diagnosis and therapy for patients globally.
- Increased awareness of the importance of timely delivery of medical radioactive material, for diagnosis and patient treatments.
- Enhanced knowledge and coordination among stakeholders in transport and regulatory frameworks.
- Shortened storage time and transport duration. Reduction of transport worker dose accumulation.
- Reduced additional use of healthcare resources and associated costs.

7.7.3 Implications for Member States

- Updating national regulations to align with the latest international requirements.
- Overseeing transport rules for medical radioactive material (especially radiopharmaceuticals) for diagnosis and medical patient applications.
- Providing proposals, for consideration at TRANSSC, to implement solutions to facilitate the transport of medical radioactive material such as new UN classification.
- Providing technical guidance and support to TRANSSC for developing new provisions.

7.7.4 Implications for International Organizations

- Information sharing of current DoS risks, costs and constraints of medical radioactive material shipments for diagnosis and medical treatments.
- Collaboration with Member States and other organizations to harmonize transport regulations.
- Promoting best practices for safe, secure and efficient transport.

7.7.5 Implications for Operators

- Adapt operational procedures to comply with new codes, labels and classifications.
- Implement internal and external prioritization mechanisms for urgent medical radioactive material (especially radiopharmaceuticals) for diagnosis and treatments.
- Enhance training for involved personnel at consignors, carriers and airport dangerous goods handling staff.
- Suggest proposals to improve relevant modal dangerous goods regulations.

7.7.6 Remaining gaps and challenges

- Lack of carrier and handling agent knowledge for prioritizing medical radioactive material.
- Insufficient awareness among carriers and regulators about the urgency of medical radioactive material (radioactivity decay, risks to patient diagnosis and treatments, etc.).
- Security requirements at airports that delay urgent medical radioactive material shipments
- Need for capacity-building and training for stakeholders involved in transport.
- The interaction of the parties involved to reach a timely consensus.
- The delays for some Member States in implementing the latest revised regulations.

7.7.7 Actions

- Member States to consider a specific UN classification and a standardized packaging for medical radioactive material, submitting proposals to the appropriate bodies and committees for new provisions for UN classification and air transport special handling codes and labels for lifesaving shipments of medical radioactive material (e.g. PRIORITY – for research or medical purposes – Perishable goods), and separate HRS (TARES) Code for radiopharmaceuticals to facilitate the import / export process and to indicate the priority, taking into account the secondary hazards and temperature requirements of radiopharmaceuticals.
- Member States to develop guidelines to prioritise transport of critical medical radioactive material, e.g. fast-tracking licensing and approval processes for stakeholders (carriers, airports, airport authorities) to encourage handling medical radioactive material shipments (radiopharmaceuticals) for diagnosis and treatments.
- Member States to collaborate with International Organizations (IAEA, ICAO, IMO, WHO, WCO, UNECE and IATA) to harmonize transport regulations for research and medical purposes to prioritize medical radioactive material shipments for diagnosis and medical treatments.
- Member States to consider developing regional hubs for expedited clearance and routing of medical radioactive material (especially radiopharmaceuticals) shipments for diagnosis and patient treatments.
- Member States and other organizations to encourage airline carriers and airport authorities to develop standard operating procedures (SOPs) for prioritizing shipments of medical radioactive material.
- Member States to assist with funding programmes for countries with limited infrastructure.
- Operators to enhance carrier and regulator awareness and knowledge of medical radioactive material for diagnosis and patient treatments, and on the urgency of timely booking, acceptance and loading of medical radioactive material.
- Carriers (including port handling service companies) to provide specialized training for personnel on handling and transporting medical radioactive material shipments safely, securely and efficiently to improve timely access to critical medical radioactive material shipments for diagnosis and medical treatments globally.
- Member States to improve co-ordination between national health authorities, local transport regulators and training providers.
- Airport and port operators to review the security procedures for urgent medical radioactive material in order to implement prioritised and time-optimised handling.

7.8 AVAILABILITY OF PORTS AND AIRPORTS FOR IMPORT, EXPORT, TRANSHIPMENT AND TRANSIT OF RADIOACTIVE MATERIAL

This mitigation measure would target the root causes linked to carriers, airports, and port authorities as it:

- Addresses the real operational drivers behind refusal of radioactive material shipments.

- Builds carrier and authority confidence in handling radioactive material safely, reducing unnecessary risk avoidance.
- Improves alignment between nuclear safety requirements and transport industry procedures.
- Minimises delays caused by misinterpretation of regulatory requirements at borders, terminals, and airports.

7.8.1 Recommendation

The DoS WG recommends Member States to maintain within their jurisdiction, the availability of ports and airports capable of allowing the import, export, transshipment and transit of radioactive material that are consistent with the **international and national regulations** for the safe and secure transport of radioactive material, including the provision of trained staff.

Further, Member States to provide port authorities and carriers with information that the transport of radioactive material in compliance with international regulations is safe, so that the stakeholders can make informed decisions.

7.8.2 General Advantages

- Increased availability of ports and airports for the transit or transshipment of radioactive material to facilitate shipment and mitigate denials and delays.
- Identification and availability of alternative ports and airports are essential contingency measures, particularly in response to geopolitical developments or changes in national policies.

7.8.3 Implications for Member States

- Encourage additional ports and airports for the transport of radioactive material by legislation of Member States.
- Ensure regulatory oversight and compliance with national and international transport safety requirements and security measures.

7.8.4 Implications for the Secretariat

Facilitate training and capacity-building activities for personnel at ports and airports, upon request by Member States, pending available resources.

7.8.5 Implications for International Organizations

Remind Member States of the importance to maintain and increase ports and airports open to radioactive material transport.

7.8.6 Implications for Operators

- Adapt operational procedures to meet specific port and airport requirements.
- Enhance training programmes for carriers and personnel involved in the handling and transport of radioactive material.

7.8.7 Remaining gaps and challenges

Limited availability of alternative or additional ports and transport routes in the event of policy changes restricting acceptance of radioactive material.

8. CONCLUSION

In conclusion, the safe and secure transport of radioactive material remains essential to public health, scientific progress, and other peaceful uses of nuclear technology. While international regulatory frameworks are robust, persistent delays in and denials of shipment continue to undermine their effective implementation — particularly for short-lived medical radioactive material (especially radiopharmaceuticals) for life-saving applications — with tangible consequences for patients, operators, and Member States alike. This White Paper demonstrates that such challenges are neither isolated nor inevitable, but stem from identifiable yet difficult-to-fully-quantify root causes that require coordinated and sustained action — by Member States, International Organizations or other organizations as applicable. Strengthening awareness of the associated risks based on risk benefit assessments, as well as the broader safety and security framework, is essential. Member States should be encouraged to recognise the benefits of these measures and to support their implementation.

However, the mapping and accurate understanding of the real DoS issue remain limited in the absence of reliable and comprehensive statistics. In particular, the reluctance and, in many cases, inability by operators to publicly disclose detailed information on delays and denials for confidentiality reasons, constrains evidence-based assessment and obscures the full scale and nature of the problem. In this context, Member States are encouraged to develop and strengthen a sustainable and structured mechanism — such as National Focal Points — to systematically collect, consolidate, and evaluate cases of delays and denials. Such mechanism would enable more consistent data gathering and support rigorous root cause analysis, forming the foundation for targeted and effective corrective actions.

Despite the continued efforts of the IAEA, International Organizations, industry, and other stakeholders, the elusiveness of durable solutions to the DoS issue suggests that it cannot be resolved through coordination alone. The responsibility therefore increasingly rests with Member States themselves — the key actors driving the call for solutions — to take decisive, harmonised, and sustained action.

Although the DoS issue cannot be entirely eliminated, its impacts can be significantly reduced through sustained political commitment, enhanced awareness, strengthened cooperation, regulatory harmonization, adequate national infrastructure, and effective national-level implementation mechanisms. These elements are essential to ensuring a globally consistent and effective system for the safe and secure transport of radioactive material.

The DoS WG has fulfilled the work set out in its mandate from the IAEA General Conference, namely to examine potential solutions to DoS, support the IAEA efforts to address the sustained challenges causing DoS, and assist Member States in developing mitigating measures for DoS issues. These are listed in the eight core mitigating measures 7.1 to 7.8 above. This White Paper is therefore commended to the General Conference for the attention of IAEA Member States.

Member States are urged to update the transport safety section of the nuclear and radiation safety resolution for GC(70), where it refers to the DoS WG, to recognise the White Paper and to endorse the recommendations and the actions required to implement those recommendations.

Should the IAEA Member States require additional work to be done by the Secretariat, then an appropriate mandate should be proposed via a new and specific General Conference resolution.

The DoS WG agreed that, following the end of the DoS WG mandate of 2023-2026, an International Forum will be needed to provide continuity and facilitate the implementation of the recommendations in this White Paper. IAEA and DoS WG members will propose an International Forum on the facilitation of safe and secure international transport before the final meeting of the IAEA DoS WG 7-11 December 2026.

ANNEX 1

Recognition of the Issue of DoS

The following preamble to the IAEA General Conference Resolution GC(69)/RES/7 of September 2025, notes the existing recognition of the issue of DoS:

(z) Recognizing that, historically, the safety record of civilian transport, including maritime transport, of radioactive materials has been excellent, and stressing the importance of international cooperation, to further enhance the safety and security of international transport,

(aa) Recognizing that denials of and delays in shipment of nuclear and radioactive materials can affect the provision of medical diagnosis and treatment, the selection of routes and modes of shipment, and the predictability of transport,

(bb) Recognizing that denials of and delays in shipment of nuclear material and radioactive materials, including with associated equipment, may impair peaceful applications of nuclear technology and have temporal implications for safety and security,

ANNEX 2

Terms of Reference of the DoS WG

Below are the terms of reference as last agreed by the DoS WG during its third meeting, 15-19 April 2024.

TERMS OF REFERENCE DENIAL OF SHIPMENT WORKING GROUP (DoS WG) Version 3 (17 April 2024)

This document will be reviewed and possibly revised at each meeting of the Denial of Shipment Working Group (DoS WG) to be consistent to the objective and the functions of the Working Group itself as they may be updated or integrated.

BACKGROUND

A robust regulatory framework has been established for safe and secure transport of radioactive material that applies to all modes of transport. The safety requirements for the transport of radioactive material are established in the IAEA Regulations for the Safe Transport of Radioactive Material, 2018 Edition (SSR-6, Rev. 1). The security recommendations for the transport of radioactive material are specified in the IAEA Nuclear Security Series (NSS) No. 14, Nuclear Security Recommendations on Radioactive Material and Associated Facilities.

Despite this robust regulatory framework, denials of and delays in shipment of radioactive materials can take place, which can negatively affect, inter alia, the provision of medical treatment and diagnosis, the selection of routes and modes of shipment, and the predictability of transport.

The Denial and Delay of Shipment issue was highlighted at the IAEA Transport Conference in 2003, and this was followed by fact-finding exercises in 2004. The IAEA General Conference then called for the establishment of a committee to address this issue, which led to the establishment of the International Steering Committee on Denial of Shipment (ISC-DOS) in 2006. The ISC-DOS met eight times, pursuing an Action Plan which led to the establishment of National Focal Points, Regional Workshops, Regional Networks and Coordinators, a Communication Strategy with supporting materials etc. The ISC-DOS was ended in 2013.

The Transport Facilitation Working Group (TFWG) was established in April 2014, following the ending of the International Steering Committee on Denial of Shipment (ISC-DOS). This was done in order to provide a level of continuity for the work that had been done by the ISC-DOS. It was formed as an independent, multi-stakeholder group of experts. Its role was to propose strategies and activities necessary to enable the efficient international transport of radioactive materials.

Among the activities undertaken, the TFWG established a website (tfwg.info), organised side meetings at IAEA GC, and carried out industry surveys, which showed that planning times have increased and that supply chains are fragile, often relying on very few carriers or routes; the effects of the pandemic on transport underlined the fragility

of Class 7 transport. It also advocated for the reactivation of the National Focal Point (NFP) network, and conducted an online webinar to explain the roles and responsibilities of a NFP, which was well attended and included an address by the IAEA DG Rafael Grossi. In 2019, the IAEA General Conference issued Resolution GC(63)/RES/9 paras 80 and 81, and the IAEA held two Technical Meetings on Denials of Shipment — Issues and Solutions and Development of the Terms of Reference for the Denial of Shipment Working Group virtually, from 23 to 26 March 2021 and from 17 to 19 August 2021 respectively. Later on, as an outcome of these meetings and in response to IAEA General Conference Resolution GC(65)/RES/8) para 79 and 80, the Denial of Shipment Working Group (DoS WG) has been established for a four-year period (2023–2026).

OBJECTIVE

The Denial of Shipment Working Group (DoS WG) objective is to consider the options for addressing denials of and delays in shipment of radioactive material, which may have safety and security consequences. The options should include sustainable mechanisms to address the causes and so reduce the instances of denials and delays of radioactive material shipments. This may include the proposal of a code of conduct on facilitation of safe and secure transport of radioactive material.

FUNCTIONS

1. Evaluate the root causes and extent of the issue of denial and delay of shipment and develop metrics to review this periodically.
2. Consider potential solutions for addressing denials of and delays in shipment, which may include a code of conduct on facilitation of transport. This consideration should include a review of the successes and less successful aspects of the International Steering Committee on Denials of Shipment of Radioactive Material that met from 2006-2013.
3. Develop awareness, training and communication strategies for various interested parties involved.

MEMBERSHIP

DoS WG membership is open to all Member States, including their Competent Authorities, and to all other interested parties such as international organizations, and non-governmental organizations.

STRUCTURE AND WORKING METHODOLOGY

The DoS Working Group Chair shall be a representative from a Member State, supported by a Co-Chair, who will manage the activities and monitor the progress of the group. The Chair/Co-chair will be selected by the DoS WG for its four-year term.

In the event of a Chair/Co-Chair standing down before the end of the four-year term, the DoS WG will re-select a Chair/Co-Chair, at the earliest opportunity, to serve for the remaining term.

The DoS WG will meet in person at least annually to review the progress and discuss the way forward.

Other means of communication, such as email correspondence or virtual meetings may be used to follow-up on the activities when required.

The IAEA Secretariat will provide the necessary support for the smooth working of the DoS WG.

The DoS WG Chair/Co-Chair will prepare the report of the meetings and this will be made available for the DoS WG members.

The DoS WG will seek to achieve its objectives by means of three (03) sub-working groups (SWGs) namely:

- (i) Sub-Working Group 1 (SWG-1): DoS Data Collection (denial of shipments and delays in shipments and their root cause analysis, efficiency of actions proposed by previous ISC-DOS), Analysis and Metrics
- (ii) Sub-Working Group 2 (SWG-2): Potential solutions to address the DoS Issue
- (iii) Sub-Working Group 3 (SWG-3): Awareness, Training and Outreach

DoS WG Members can participate in any of the SWGs as appropriate. Each SWG will select a Chair and Co-Chair for its four-year term.

In the event of a SWG Chair/Co-Chair standing down before the end of the four-year term, the appropriate DoS SWG will re-select a Chair/Co-Chair, at the earliest opportunity, to serve for the remaining term.

The SWG Chair(s)/Co-Chair(s) will maintain a list of members which will be shared with the IAEA Secretariat, if updated.

Each SWG will develop a workplan which will be updated after every DoS WG meeting.

The DoS SWG Chair(s)/Co-Chair(s) will manage the activities and monitor the progress of their respective groups, coordinate with the other SWG and report their progress to the DoS WG. The SWG reports will be made available for the DoS WG/SWG members.

ANNEX 3

DoS WG Membership and Participation

As of the sixth meeting of the DoS WG 20-22 April 2026, the current membership of the DoS WG was as follows:

Representing	Salutation	Name	Institution Name	Attendance at DoS WG meetings					
				1	2	3	4	5	6
Argentina	Mr	Alejandro Gabriel Fernandez	Autoridad Regulatoria Nuclear (ARN)	1					
Argentina	Mr	Horacio Martín Lee Gonzales	Autoridad Regulatoria Nuclear (ARN)						
Armenia	Mr	Nikolay Avagyan	Armenian Nuclear Power Plant (ANPP)				4 (remote)		6 (remote)
Australia	Ms	Marina Francis	Australian Permanent Mission to the IAEA, Counsellor (Nuclear)	1	2	3	4	5	
Australia	Ms	Samantha Ellis	Civil Aviation Safety Authority (CASA)						
Australia	Mr	Samir Sarkar	Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)						6 (remote)
Bangladesh	Mr	Mustafijur Rahman	Bangladesh Atomic Energy Regulatory Authority (BAERA)						
Belgium	Mr	Guy Lourtie	Federal Agency for Nuclear Control (FANC)						
Bolivia	Ms	Lola Aguilar Serrano	Bolivian Nuclear Energy Agency						
Bolivia	Mr	Luis Fernando Mejía Uría	Bolivian Nuclear Energy Agency						
Brazil	Mr	Heber Simões Videira	Medical Armazenagem Logística e Distribuição Ltda			3			
Brazil	Mr	Natanael de Carvalho Bruno	Brazilian National Commission of Nuclear Energy (CNEN)		2	3			6 (remote)
Brazil	Ms	Thaís Antunes Freitas Valente	Indústrias Nucleares do Brasil - INB				4 (remote)		6 (remote)
Brazil	Ms	Elba Etchebehere	SBMN					5 (remote)	
Canada	Mr	Marc-André Charette	Cameco Corporation			3	4	5 (remote)	6
Canada	Mr	Rajesh Garg	Canadian Nuclear Safety Commission	1			4 (remote)	5 (remote)	6 (remote)

Canada	Ms	Terry Soulsby	Nordion (Canada) Inc.	1	2	3	4	5	6
Dominican Republic	Mr	Gerson Polanco Dominguez	Dr. Heriberto Pieter Cancer Institute						
Dominican Republic	Mr	Luis Alberto Morilla Rodríguez	Ministry of Energy and Mines						
Dominican Republic	Mr	Santo Soriano Heredia	Ministry of Energy and Mines						
Dominican Republic	Mr	Willy de Jesús Suriel López	Ministry of Energy and Mines						
Ecuador	Ms	Iralda Esthela Ramos Altamirano	Nuclear Control and Applications (SCAN)						
Egypt	Mr	Yasser Lasheen	Egyptian Nuclear and Radiological Regulatory Authority (ENRRA)	1			4 (remote)		
Egypt	Mr	Yasser Tawfik Mohamed Selim	Egyptian Atomic Energy Authority (EAEA)	1		3			
Estonia	Mr	Richard Lõhkivi	Environmental Board						
Finland	Ms	Anna Neilick	STUK - Radiation and Nuclear Safety Authority						
France	Ms	Anne Presta	ORANO Nuclear Packages & Services		2	3	4	5	6
France	Mr	Christian Tertrais	Permanent Mission				4		
Germany	Ms	Anne Timm	Hapag-Lloyd				4		6
Germany	Mr	Dominik Kaufhold	Bundesamt für die Sicherheit der Nuklearen Entsorgung (BASE)		2	3	4	5	
Ghana	Mr	Emmanuel Akrobortu	Nuclear Regulatory Authority				4 (remote)		
Ghana	Mr	Eric Tetteh Glover	Radiation Protection Institute Ghana Atomic Energy Commission (GAEC)						
Iran	Mr	Farhad Golfam		1					
Iran	Mr	Hossein Reies Mohammad	Iranian Nuclear Regulatory Authority (INRA); Atomic Energy Organization of Iran (AEOI)		2	3			
Iraq	Mr	Lazim K. Shwayyea	Ministry Of Environment/ Radiation Protection Center (RPC)		2				
Iraq	Mr	Zuhair Samir Abdulsada	Ministry Of Environment/ Radiation Protection Center (RPC)						
Italy	Mr	Paolo Alvano	National Inspectorate for Nuclear Safety and Radiation Protection (ISIN)	1	2	3	4	5	6

Italy	Mr	Alessandro Orsini	National Inspectorate for Nuclear Safety and Radiation Protection (ISIN)					5	
Italy	Ms	Marie Aude Tavoso	National Inspectorate for Nuclear Safety and Radiation Protection (ISIN)					5 (remote)	
Japan	Mr	Takuji Fukuda	Nuclear Regulation Authority	1	2				6 (remote)
Jordan	Mr	Amer Hussein	Energy & Minerals Regulatory Commission (EMRC) Head of Border Control						
Jordan	Mr	Luai Khalil	Energy & Minerals Regulatory Commission (EMRC)						6 (remote)
Mauritania	Mr	Mohamed Mahmoud Mounja	Head of Inspection Service in National Authority of Radiation Protection, Safety and Nuclear Security (ARSN)	1		3		5 (remote)	
Mauritania	Mr	Mohamed Moussa Ishagh	President of National Authority of Radiation Protection, Safety and Nuclear Security (ARSN)						
Norway	Mr	Joe Moussa	Norwegian Radiation and Nuclear Safety Authority	1					
Philippines	Ms	Jeana Lee P. Sablay	Philippine Nuclear Research Institute				4 (remote)		6 (remote)
Philippines	Ms	Vallerie Ann I. Samson	Philippine Nuclear Research Institute						
Philippines	Ms	Vida Flor G. Magbual	Department of Trade and Industry						
Russia	Mr	Alexander Buchelnikov	State Atomic Energy Corporation «ROSATOM	1		3	4	5	6 (remote)
Russia	Mr	Vladimir Nikolaevitch Ershov	Rosatom Emergency Response Centre, Joint-Stock Company (Rosatom ERC JSC)	1		3	4	5	
Saudi Arabia	Dr	Abdulmohsen Abanumy	Nuclear and Radiological Regulatory Commission (NRRC)			3	4	5	6 (remote)
Saudi Arabia	Mr	Jehad Ali Alsaif	Nuclear and Radiological Regulatory Commission (NRRC)			3		5	
Singapore	Mr	Chew Boon Kiat	National Environment Agency (NEA)	1	2				
Singapore	Mr	Yoke Ping Tan	National Environment Agency (NEA)				4 (remote)	5 (remote)	6 (remote)

Switzerland	Mr	Frank Koch	Swiss Federal Nuclear Safety Inspectorate (ENSI)		2			5 (remote)	6 (remote)
Switzerland	Mr	Philippe Bertreix	CERN				4		
Switzerland	Mr	Ulrich Zimmermann	Paul Scherrer Institut	1	2		4	5	6
Türkiye	Ms	Cangül Aktürk Polat	Nuclear Regulatory Authority of Turkey						
Türkiye	Ms	Safiye Tuba Ecevit	Nuclear Regulatory Authority of Turkey		2				6 (remote)
Türkiye	Ms	Sinem Tokmak	Nuclear Regulatory Authority of Turkey						
United Kingdom	Mr	Alan Bacon	Nuclear Transport Solutions (NTS)						
United Kingdom	Mr	Alastair Brown	Nuclear Transport Solutions (NTS)	1	2	3	4	5	6
United States of America	Ms	Briar Rabaey	National Nuclear Security Administration (NNSA) Office of Radiological Security (ORS)	1		3	4		
EC	Ms	Ana Rita Lopes Ramos	European Commission					5	
ICAO	Mr	Virgilio Alegría Magos	International Civil Aviation Organization (ICAO)				4	5	6 (remote)
IMO	Mr	Antti Nironen	International Maritime Organization (IMO)			3	4 (remote)	5	
IMO	Mr	Alfredo Parroquín-Ohlson	International Maritime Organization (IMO)	1	2		4		6
UNECE	Ms	Alibech Mireles	UNECE				4 (remote)		
UNECE	Mr	Romain Hubert	UNECE				4 (remote)		
UNECE	Mr	Armando Serrano Lombillo	UNECE	1					
IFALPA	Mr	Timo Lempiäinen	International Federation of Air Line Pilots' Associations (IFALPA)	1	2	3	4	5	
ISSPA	Mr	John J. Miller	International Source Suppliers and Producers Association (ISSPA)		2	3			
T.I.C.	Mr	Ian Margerison	Tantalum-Niobium International Study Center (T.I.C.)	1				5	
WNA	Mr	Serge Gorlin	World Nuclear Association (WNA)	1	2		4 (remote)		
WNA	Mr	Allarakha Vora	World Nuclear Association (WNA)				4	5	6 (remote)

WNA	Mr	Kurtis Hinz	World Nuclear Association (WNA)	1		3	4	5	6 (remote)
WNA	Mr	Tony Grange	World Nuclear Association (WNA)						
WNA	Mr	Jack Edlow	World Nuclear Association (WNA)	1					
WNA	Ms	Franchone Oshinowo	World Nuclear Association (WNA)	1	2	3	4	5	6
WNTI	Mr	Simon Chaplin	World Nuclear Transport Institute (WNTI)	1	2	3	4	5	6
WNTI	Mr	Greg Ramsdale	World Nuclear Transport Institute (WNTI)				4	5 (remote)	6 (remote)
WNTI	Mr	Michael Meier	World Nuclear Transport Institute (WNTI)	1			4		6
WNTI	Ms	Monique Ginoux	World Nuclear Transport Institute (WNTI)	1	2		4	5 (remote)	6
WNTI	Ms	Ines Desmet	World Nuclear Transport Institute (WNTI)						6
WNTI	Mr	Malcolm Chisholm	World Nuclear Transport Institute (WNTI)						6
WNTI	Mr	Peter Bryant	World Nuclear Transport Institute (WNTI)						6 (remote)
WNTI	Ms	Emily Midgley	World Nuclear Transport Institute (WNTI)		2	3	4		

Additional invited experts were:

Representing	Salutation	Name	Institution Name	Attendance at DoS WG meetings					
				1	2	3	4	5	6
Belgium	Mr	Harisson Vankets	Transrad			3			
Belgium	Mr	Ken Waterschoot	Transrad			3			
Italy	Mr	Antonio Proietti	Sogin			3			
Italy	Mr	Gianrico Lombardi	Sogin			3			
Malta	Mr	Joseph Cremona	Commission for the Protection From Ionising and Non-Ionising Radiation						6 (remote)
Norway	Ms	Yevgeniya Tomkiv	SHARE				4 (remote)		
Spain	Mr	Manuel Leiva	CSN					5 (remote)	
Sweden	Mr	Marcus Örtenblad	Maersk						6
Sweden	Mr	Mats Bäckström	DG Safety Group						6

Türkiye	Mr	Erdi Karatepe	Curium					5	6 (remote)
United Kingdom	Mr	Jim Ring	Gig House Films	1					
WNTI	Mr	Carlos Grau Tanner	World Nuclear Transport Institute (WNTI)		2				

Former members of the DoS WG include:

Representing	Salutation	Name	Institution Name	Attendance at DoS WG meetings					
				1	2	3	4	5	6
Argentina	Mr	Alejandro Leciñana Blanchard	Autoridad Regulatoria Nuclear (ARN)		2				
Brazil	Ms	Ana Celia Freitas Sobreira	ACERTS Nuclear				4 (remote)		
Finland	Mr	Antti Takkinen	STUK – Radiation and Nuclear Safety Authority						
Slovakia	Ms	Alenka Bujnová	Nuclear Regulatory Authority of the Slovak Republic	1					
Slovakia	Mr	Juraj Vaclav	Nuclear Regulatory Authority of the Slovak Republic	1					
Slovakia	Mr	Markus Helej	Public Health Authority of the Slovak Republic	1					
Thailand	Mr	Soratos Tantideeravit	Office of Atoms for Peace (OAP)	1					
ICAO	Ms	Katherine Rooney	International Civil Aviation Organization (ICAO)	1	2	3			
IMO	Mr	Bingbing SONG	International Maritime Organization (IMO)						
IATA	Ms	Candy Chan	International Air Transport Association (IATA)	1					
T.I.C.	Mr	Ulric Schwela	Tantalum-Niobium International Study Center (T.I.C.)	1	2				

ANNEX 4

Summary of Survey Results and DoS WG Challenges in Collection of Data

The following table summarises the surveys issued and the response rate:

Date Survey Issued	Survey Type	No. of Stakeholders Contacted	No. of Responses (with % response rate)
11 January 2024	Industry	35	21 (60%)
9 February 2024	Member States	329	45 (14%)
31 October 2024	Carriers	33	17 (52%)
19 December 2024	Member States	329	43 (13%)
15 January 2025	Industry	35	7 (20%)

General survey findings including challenges:

- Main conclusions addressing trends, specific instances, causes, and root causes.
- Several (but not all) MS reported deviations from SSR-6. Confirms that it would be useful to collate and publish these.
- Other regulations also have impacts, particularly customs and security.
- Numerical analysis is difficult – many MS do not have good data on numbers of shipments or carriers.
- Largest transport sectors are Medical and Industrial. Road, Air and Maritime are most frequently used modes. Rail and Inland Waterway are much lower (by order of magnitude).
- Most problems identified relate to air and maritime transport.
- Often extra information required at last moment by carriers, which can lead to delay.
- As legislation on radioactive material differs between countries it's difficult to have oversight of all requirements; mostly related to licensing but also more specific to emergency response, training and sometimes additional to international approved requirements.
- Root causes mainly:
 - Carriers (shipping lines or airlines) or ports refusing or restricting radioactive material to certain UN codes.
 - Some MS have very few ports or airports which accept radioactive material.
 - Transit and Transshipment are often not allowed or restricted to certain UN codes.
 - Policy of only carrying on own (not charter or partner company) vessels.
 - Insurance requirements and costs.
 - Regulatory complexity and differences between countries (lack of harmonisation).
 - Cost of training and compliance for low volume business.
 - Perception of risk.

ANNEX 5

Correlation of Root Causes, Consequences Observed, and Mitigation measures

The following chart shows the interrelationship between the root causes of DoS identified by the DoS WG, the main types of consequences that have been observed, and which mitigation measures may successfully best address those consequences, as well as additional influences between root causes, consequences, or mitigation measures.



