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MULTI-SECTOR WORKSHOP ON INNOVATIVE REGULATION

Challenges and benefits of harmonising the licensing process for emerging technologies

14-18 December 2020

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MULTI-SECTOR WORKSHOP ON INNOVATIVE REGULATION

Challenges and benefits of harmonising the licensing process for emerging technologies

Welcome

Day 3 – Wednesday 16 December

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Session 4

The international licensing system for transportation of nuclear material: a success story and a look to the future

Mr. Martin PORTER

Secretary General of the World Nuclear Transport Institute

World Nuclear Transport Institute

Working Within The International RAM Transport Regulatory Framework

Martin Porter – WNTI Secretary General
December 2020

Resume

- 25 years as a professionally-qualified Occupational Hygienist working under an enabling regulatory framework (UK HASAWA)
- 11 years experience as an operator (Consignor duty-holder) working in the UK under the UN/IAEA/ADR/RID/IMDG/IATA/CDG framework and transporting nationally and internationally:
  - Dispatched and received spent fuel shipments in support of the UK fuel cycle
  - Reprocessed product shipped to supply fuel manufacture
  - 1.2 x 10^{18} Bq of vitrified HLW shipped safely and securely overseas
  - ILW, LLW, consolidation and research materials successfully transported
- 8 months as Secretary General of the World Nuclear Transport Institute
  - Provide value for money services to our 50 member organisations as an NGO
  - Offer a forum for technical exchange
  - Engage with policy-makers and other key stakeholders to better position transport

Background

- UN/IAEA/modal/national framework has existed for many decades
- Basis of regulations is heavily prescriptive rather than enabling or target-setting
- Broadly remains relevant but some old, existing and new nuclear processes now presenting challenge

Old Nuclear Challenge

- Post-operation clean-out (POCO) and decommissioning activities are manifesting novel payloads
- Higher (relative) dose rates from low activity materials present a particular challenge
  - Dose rates exceed current Industrial Package (IP) limits
  - Type B design/testing/manufacturing can be prohibitively expensive
- Hybrid (Type W/IP4) package is being considered
- Current thinking is that a technical case can be made for safety and security
- Economic case is being developed

Existing Nuclear

- Safety design basis is challenged by extreme natural events and credible accident scenario
- Security is informed by intelligence and learning from experience of ever more aggressive challenges (cyber and physical)
- Safety and security ideals not always mutually inclusive
- Is it security-informed nuclear safety?, or:
- Is it safety-informed nuclear security?
- Reality is that it has to be safe and secure

New Nuclear

- Small modular reactors and floating nuclear power plants are now a reality
- Current transport regulatory framework is broadly two-tiered
  - Low risk materials are deemed safe by payload (quantity and/or activity)
  - Higher risk materials are safe by engineering (robust packaging) and control (EPR etc)
- New nuclear may challenge the rigidity of the current, prescriptive regulatory framework

So What?

WNTI perspective is that the challenges require careful consideration, consultation and collaboration, such that;

- Policy is informed by the challenges that transporters face
- Regulatory deployment involves enablement and encouragement alongside enforcement
- Operators can demonstrate the competence to stay safe and secure whilst embracing change

WNTI Direction

- REACH OUT TO OUR STAKEHOLDERS
- Fully exploit Observer Status at IAEA to lobby on behalf of our members (active participation in TRANSSC & TTEG's) in seeking fit-for-purpose regulations
- Engage with regulatory community to explore the 'art of the possible' on new ways of working
- Develop processes to harmonise competence (across frontiers) and encourage peer exchange for continuous improvement
  - Enhance policy-maker and regulator confidence in transport capability
  - Anticipate the next generation by redressing the transporter demograph (age, ethnicity and gender)

Summary

- The transport of radioactive materials is enabled because the public broadly accept that we, collectively, deliver it safely and securely (70 years of safe delivery attest to this)
- A changing environment makes the demonstration of safety and security a more complex dynamic
- The key to success is collaboration between policy-makers, regulators and operators in developing inclusive, fit-for-purpose ways of working

WNTI Contacts

Further information is available from WNTI:

- Website: www.wnti.co.uk
- Email address: wnti@wnti.co.uk
- Office: WeWork Aviation House, 125 Kingsway, London, UK.
- Telephone: +44 (0) 207 580 1144

Mr. Steve WHITTINGHAM

Head of the Transport Safety Unit, United Nations
International Atomic Energy Agency

IAEA
International Atomic Energy Agency

The International Regulatory Framework for the Transport of Radioactive Material

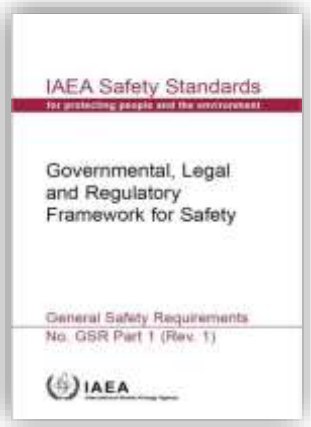
Multi-sector workshop on innovative regulation: challenges and benefits of harmonising the licensing process for emerging technologies

OECD-NEA 14 – 18 December 2020

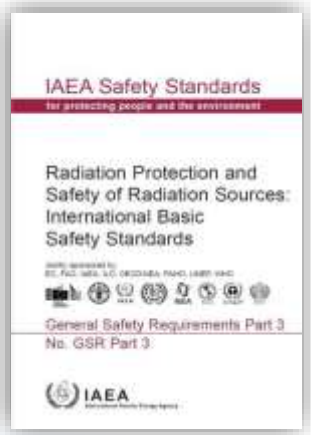
Stephen Whittingham
Head of Transport Safety Unit
Division of Radiation, Transport & Waste Safety
Department of Nuclear Safety and Security
email: s.whittingham@iaea.org

Publication History of IAEA ‘Regulations for the Safe Transport of Radioactive Material’	
Safety Series No.6, 1961 Edition	1961
Safety Series No.6, 1964 Revised Edition	1964
Safety Series No.6, 1967 Edition	1967
Safety Series No.6, 1973 Revised Edition	1973
Safety Series No.6, 1973 Revised Edition (As Amended 1979)	1979
Safety Series No.6, 1985 Edition	1985
Safety Series No.6, 1985 Edition, 1986 Supplement	1986
Safety Series No.6, 1985 Edition, 1988 Supplement	1988
Safety Series No.6, 1985 Edition (As Amended 1990)	1990
TS-R-1, 1996 Edition	1996
TS-R-1, 1996 Edition (Revised)	2000
TS-R-1, 1996 Edition (As Amended 2003)	2003
TS-R-1, 2005 Edition	2005
TS-R-1, 2009 Edition	2009
SSR-6, 2012 Edition	2012
SSR-6 (Rev.1), 2018 Edition	2018

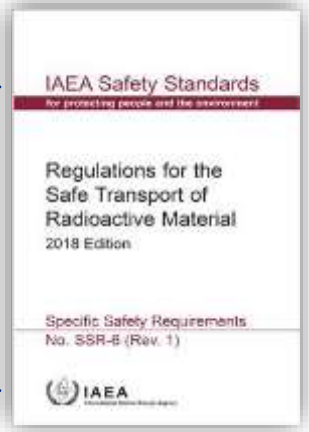
The IAEA Safety Standards



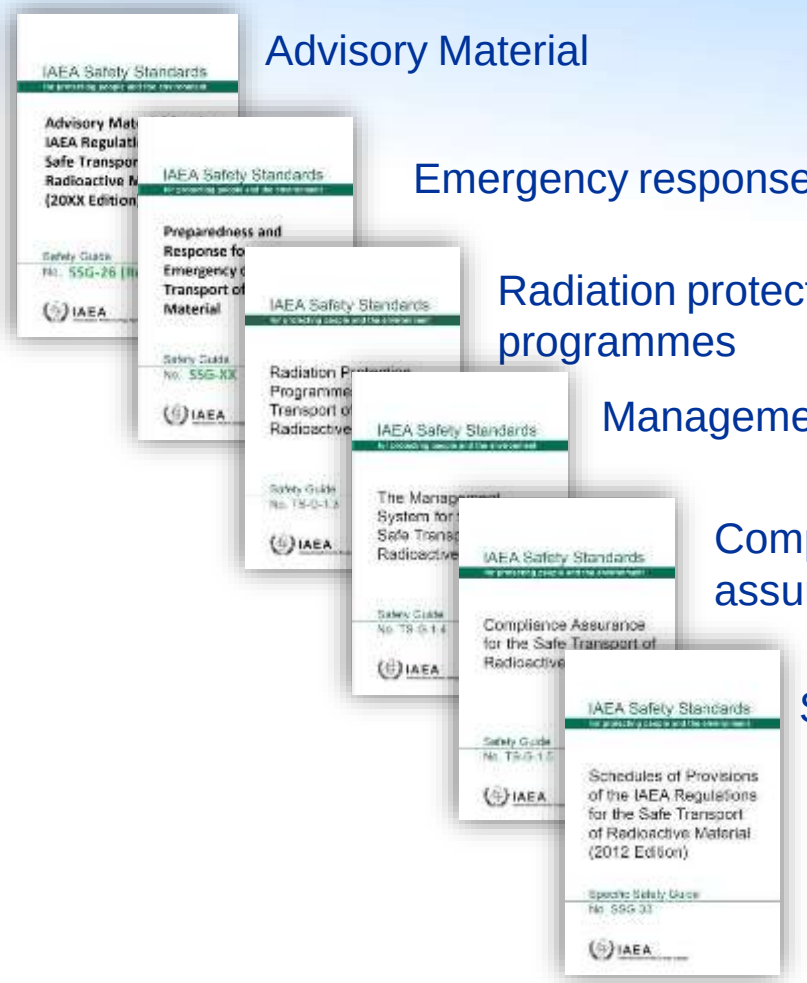
GSR Part 1



GSR Part 3



SSR 6 (Rev.1)



Advisory Material

Emergency response

Radiation protection programmes

Management System

Compliance assurance

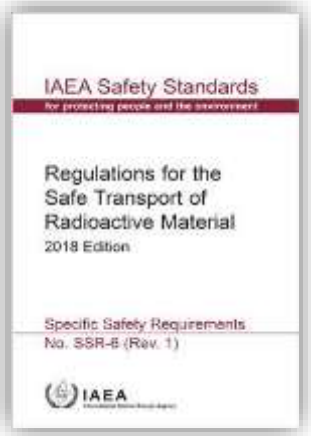
Schedules

+ Contents and Format of a Package Design Safety Report
- Scheduled for publication in 2021

Guidance Documents

IAEA - SSR-6

- Prescriptive requirements - reviewed on biennial basis (12 months to complete), revised (2 – 3 years to complete) when necessary
- Supported by Advisory Material – aids consistent interpretation
- Global, multi-modal but not mandatory
- All 171 IAEA Member States can participate in review process
- Transposed into UN Model Regulations
- Text does not look like UN or modal text
- No guidance for UN or modal provisions, so legal text needs to address everything

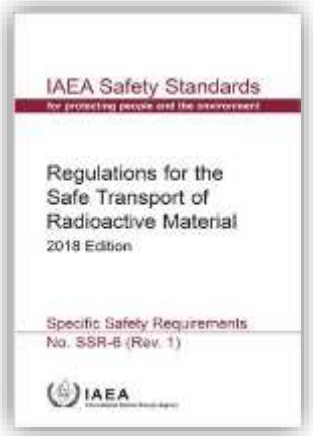


IAEA – SSR-6

Objective of SSR-6 (para. 104)

… is to establish requirements that must be satisfied to ensure safety and to protect persons, property and the environment from the effects of radiation in the transport of radioactive material. This protection is achieved by requiring:

- Containment of the radioactive contents;
- Control of external radiation levels;
- Prevention of criticality;
- Prevention of damage caused by heat.



No routeing or physical protection controls are specified - these may be implemented by Member States for reasons other than radiological safety

IAEA – SSR-6

Regulatory approach (SSR-6 para. 106)

A graded approach is applied in specifying the performance standards which are characterized in terms of three general severity levels:

(a) Routine conditions of transport (incident free);

(b) Normal conditions of transport (minor mishaps);

(c) Accident conditions of transport.

IAEA – SSR-6, Definitions

'Transport' (SSR-6 para. 106)

… Transport comprises all operations and conditions associated with, and involved in, the movement of *radioactive material*; these include the **design, manufacture, maintenance and repair of *packaging*, and the preparation, consigning, loading, carriage including in-transit storage, unloading and receipt at the final destination of loads** of *radioactive material* and *packages*.

Radioactive material (SSR-6 para. 235)

… any material containing radionuclides where both the activity concentration (Bq/g) and the total activity in the *consignment* (Bq) exceed the values specified in paras. 402 - 407

IAEA - SSR-6 – Review / Revision processes

Review (12 months)

- Member States invited to submit proposals for change
- Proposed changes are assessed by TRANSSC (accept, reject or request more information)
- TRANSSC determines if safety significant proposals have been accepted
- NO – SSR-6 remains unchanged
- YES – **Revision process initiated (2 – 3 years)**
- Document Preparation Profile (DPP) is submitted for approval to the coordination committee and then the Commission for Safety Standards (CSS)
- Revised draft prepared through consultants meetings to reflect accepted proposed changes
- Revised draft submitted to TRANSSC for approval and then submitted to MS for comment
- MS comments reviewed by consultants meetings and a final draft is submitted to TRANSSC for approval
- Following TRANSSC approval, the final draft is submitted for approval to the other IAEA Safety Committees followed by the CSS and then the IAEA Board
- The revised SSR-6 is then published

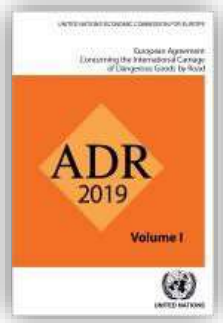
The international regulatory framework

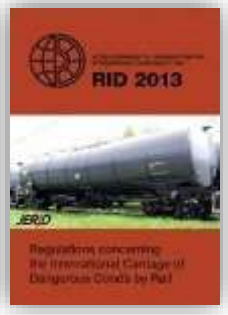
Used as a reference by some Package design approval Regulators / some MS Transport Regulations

Some countries

SSR 6 (Rev.1)
Class 7 - All modes

All 9 Dangerous Goods Classes - All modes



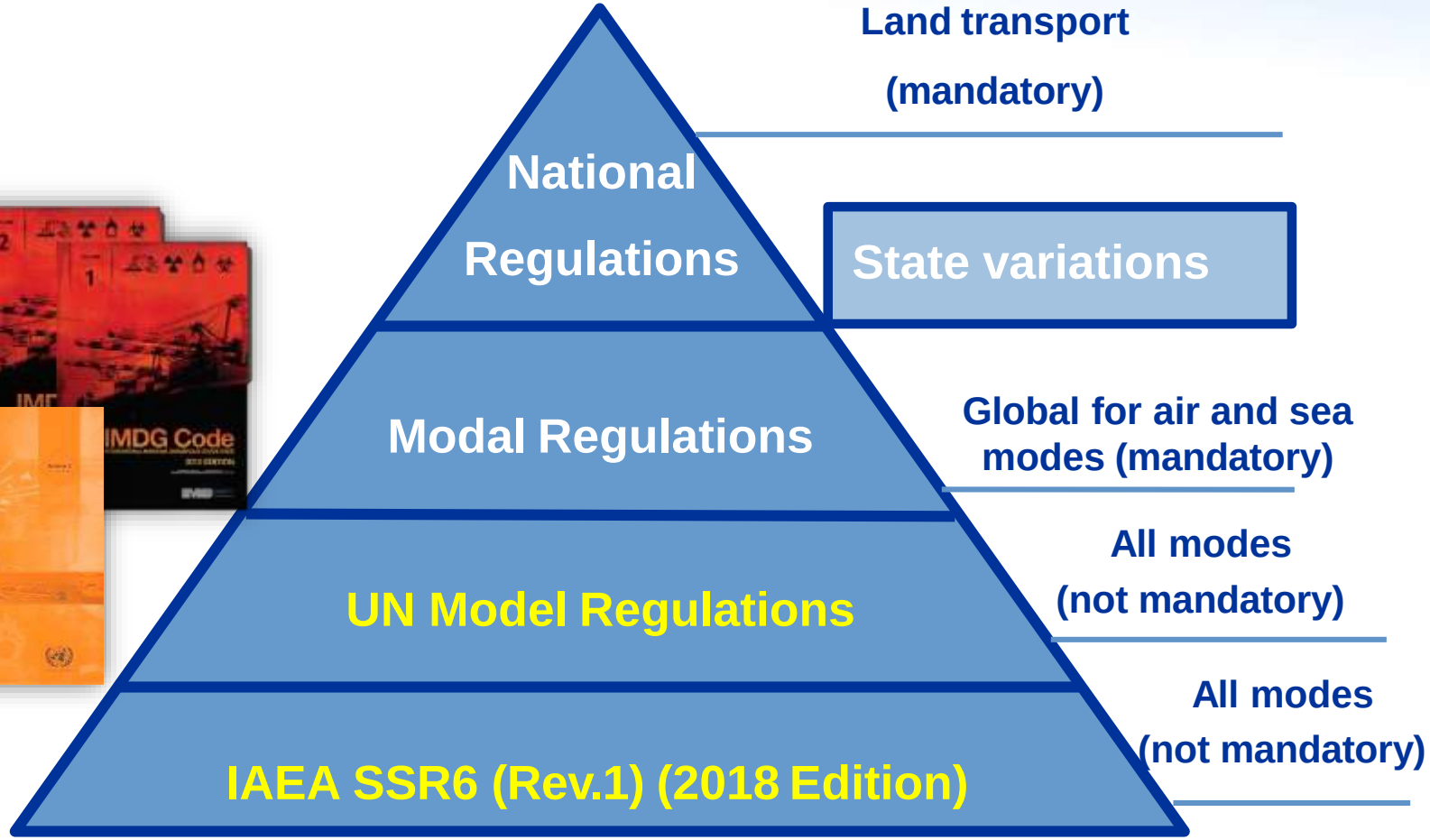


Regional Agreements eg
Road, Rail and Inland Waterway

Sea

Air

Regulations – International framework



SSR-6 Graded approach, UN numbers

UN number	Proper shipping name
Excepted package	
UN 2908	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – EMPTY PACKAGE
UN 2909	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – ARTICLES MANUFACTURED FROM NATURAL URANIUM or DEPLETED URANIUM or NATURAL THORIUM
UN 2910	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE –LIMITED QUANTITY OF MATERIAL
UN 2911	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – INSTRUMENTS or ARTICLES
UN 3507	URANIUM HEXAFLUORIDE, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - less than 0.1 kg per package, non-fissile or fissile excepted
Low specific activity material (LSA-I, LSA-II, LSA-III)	
UN 2912	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I), non-fissile or fissile excepted
UN 3321	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), non-fissile or fissile excepted
UN 3322	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), non-fissile or fissile excepted
UN 3324	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE
UN 3325	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE
Surface contaminated objects (SCO-I, SCO-II, SCO-III)	
UN 2913	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I, SCO-II or SCO-III), non-fissile or fissile excepted
UN 3326	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II, SCO-III), FISSILE

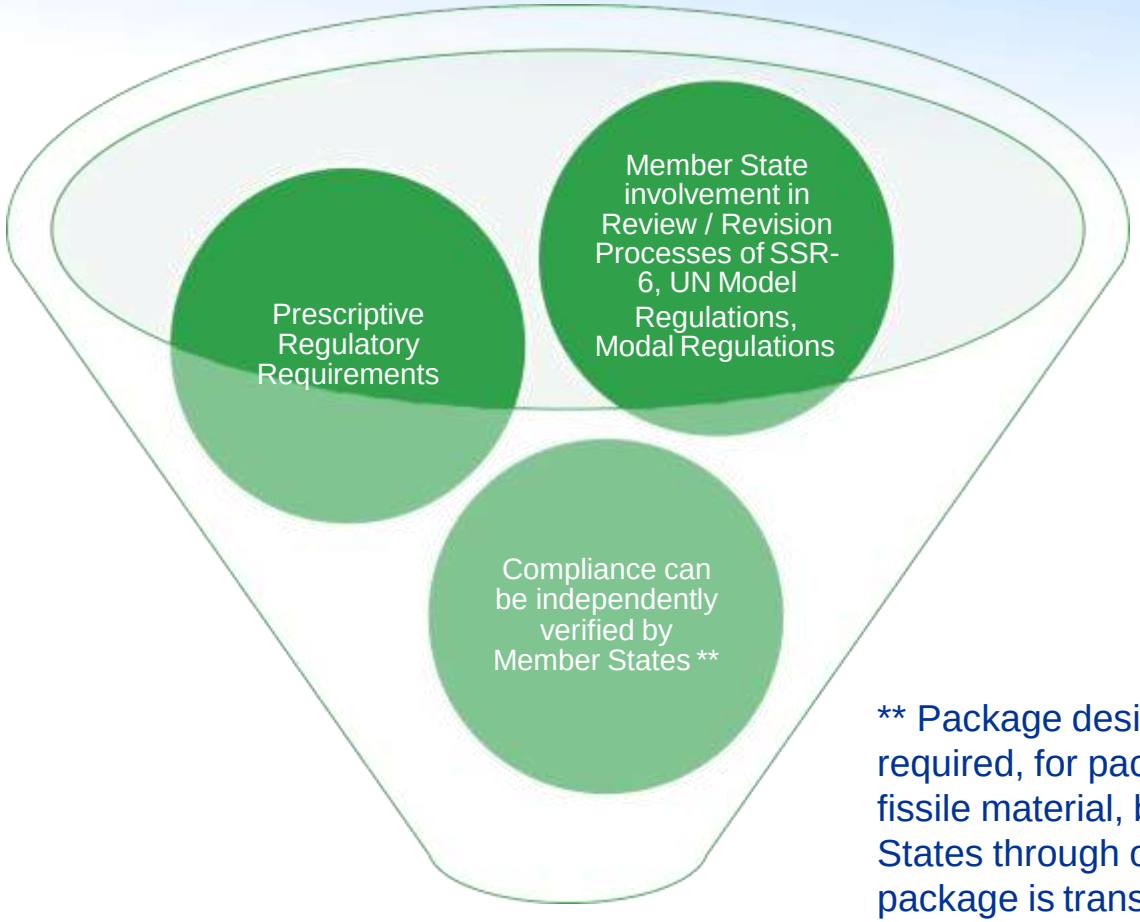
Requires competent authority approval

SSR-6 Graded approach, UN numbers

UN number	Proper shipping name
Type A package	
UN 2915	RADIOACTIVE MATERIAL, TYPE A PACKAGE, non-special form, non-fissile or fissile excepted
UN 3327	RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE, non-special form
UN 3332	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, non-fissile or fissile excepted
UN 3333	RADIOACTIVE MATERIAL, TYPE A PACKAGE,SPECIAL FORM, FISSILE
Type B(U) package	
UN 2916	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE , non-fissile or fissile excepted
UN 3328	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE
Type B(M) package	
UN 2917	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE , non-fissile or fissile excepted
UN 3329	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE
Type C package	
UN 3323	RADIOACTIVE MATERIAL, TYPE C PACKAGE, non-fissile or fissile excepted
UN 3330	RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE
Uranium hexafluoride	
UN 2977	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE
UN 2978	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile excepted
Special arrangement	
UN 2919	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non-fissile or fissile excepted
UN 3331	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE

Requires competent authority approval

Compliance with SSR 6 requirements



** Package design verification is required, for packages containing fissile material, by Member States through or into which the package is transported

Build a basis for mutual trust that enables Cooperation / Collaboration / Global Adoption of a Harmonized Regulatory Framework

Innovation in the context of international cooperation

Innovation

In the context of the international transport safety framework, innovation can be perceived as a potentially disruptive technology if

- it is related to a safety function, and
- Compliance with regulatory requirements cannot be independently verified

Consequently, innovation has the potential to disrupt international cooperation, increasing the risk of international cooperation becoming increasingly problematic OR simplify the international cooperation, if innovations bring undisputable safety improvements

Transport

The transport of radioactive material fits within a regulatory framework of international cooperation that has been reviewed, developed and refined by Member States since 1961.

Innovation can be accommodated if it can be incorporated within the approach of the transport regulations; that is, compliance with prescribed administrative, operational and performance-based requirements that can be, or are required to be, independently verified by Member States

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Thank you!

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Workshop Moderator

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OECD/NEA "MULTI-SECTOR WORKSHOP ON INNOVATIVE REGULATION: CHALLENGES AND BENEFITS OF HARMONISING THE LICENSING PROCESS FOR EMERGING TECHNOLOGIES"

SESSION 4 PANEL : THE INTERNATIONAL LICENSING SYSTEM FOR TRANSPORTATION OF NUCLEAR MATERIAL: A SUCCESS STORY AND A LOOK TO THE FUTURE

DG Jean-Christophe Niel

MEMBRE DE ETSON

Session 4 - December 16th, 2020 – Panel - Proposed points to be discussed

Main point : Harmonization of regulations doesn't guarantee harmonization on the ground

- Necessary harmonization due to the strong international nature of this activity
- Be aware about the differences in the safety case generated by the use of different approaches
- Importance of harmonization through the technical approaches related to safety regulation
- Issues related to increase digital safety demonstration
- Promote enhanced interactions between stakeholders (meetings such as Transsac, symposium PATRAM, networks, shared technical issues,..)

Shared safety evolutions take (too much) time to be implemented on the ground

- How to make more efficient the four steps : consolidating the experience feedback, integrate it in the international regulation, transfer it to national regulation, make it operational?

Technically founded rules, don't forget humans

- How to better implement human and organizational factor relevant to safety issues ?
- How to interact with people about nuclear activities implemented near them?

Interfaces consistency

- Facilities versus transports
- International versus national
- Nuclear safety versus nuclear security
- Normal operation versus nuclear emergency

Ms. Rebecca TADESSE

Head of Radioactive Waste Management and Decommissioning Division, OECD Nuclear Energy Agency

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RWMD Perspectives on Transportation of Fuel and Waste

Rebecca TADESSE

Head of the Division of Radioactive Waste Management and Decommissioning (RWMD), Nuclear Energy Agency

SAF Workshop, 2020

Transportation Challenges

1. Package

Transportation packages need to be certified for shipping the unique waste streams from non-light water reactors (LWRs).

2. Waste form

The chemical and physical form of radioactive material in unirradiated fuel, spent fuel and radioactive waste from non-LWRs need to be evaluated.

3. Modelling

Radionuclide inventory of non-LWRs may not present in computational codes for analysis of transportation or radiological impact of its accidents.

4. Criticality

Reduced number of criticality benchmarking is available above 5% enrichment, so additional analysis is necessary to support cask design and transportation.

Anticipated Regulatory Challenges

Enrichment and Fabrication Facilities

- Most commercial fuel cycle facilities are licensed to produce up to 5% enriched material.

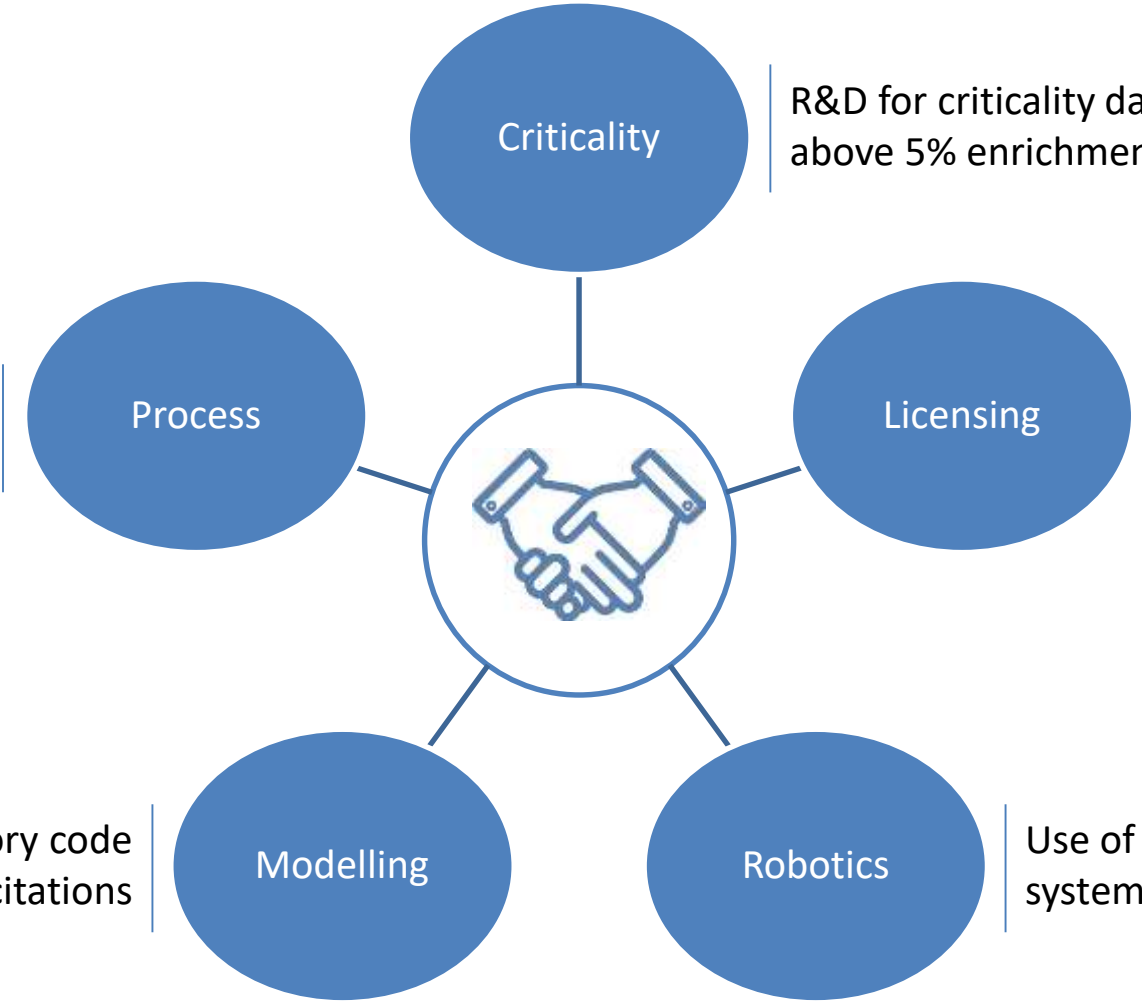
UF_6 Transportation

- Existing UF_6 transportation packages are approved for up to 5% enrichment.

Fresh/Spent Fuel Transportation & Storage

- Shipping package certification for unique waste from non-LWRs.
- Fuel integrity and criticality safety.

Areas for Collaboration



R&D for criticality data above 5% enrichment

Streamline exising process for characterisation and transportation

Multi-national transportation cask, requirements, licensing framework

Technical assessments, confirmatory code development, and expert elicitations

Use of innovative technology, such as robotic system and sensors to monitor casks

Thank you for your attention.

If you have questions, contact Rebecca Tadesse [Rebecca.Tadesse@oecd-nea.org].

www.oecd-nea.org/jcms/c_12892

Mr. Serge GORLIN

Head of Industry Cooperation Department at World Nuclear Association (WNA)

WORLD NUCLEAR ASSOCIATION

Reactor Design Evaluation and Licensing: Lessons Learned from Transport Harmonization

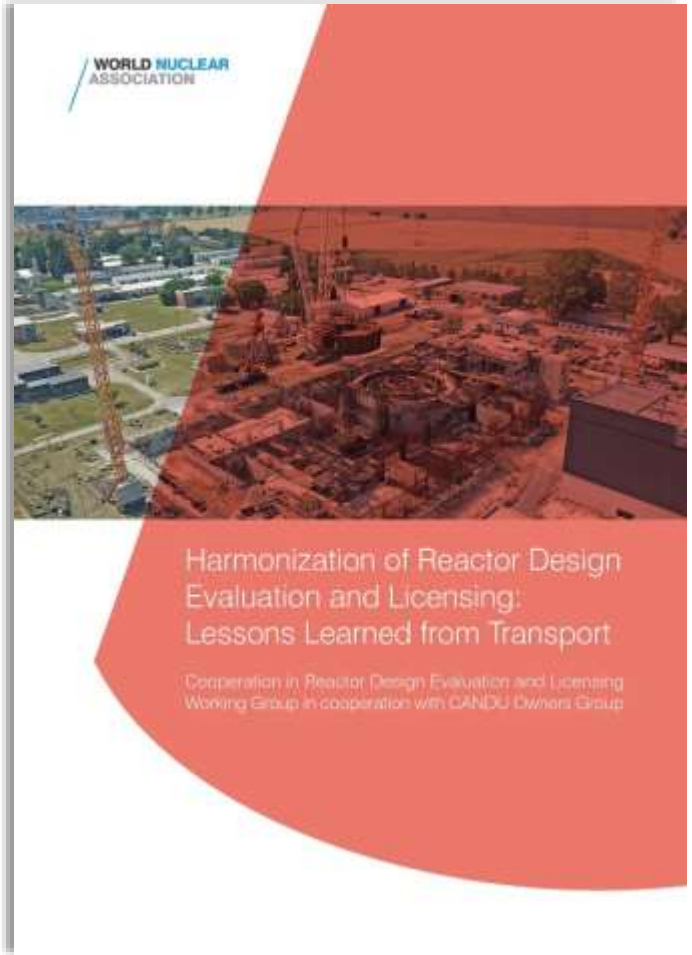
Serge Gorlin

Head of Industry Cooperation

NEA Workshop on Innovative Regulation

16 December 2020

Radioactive material transport model



Genesis

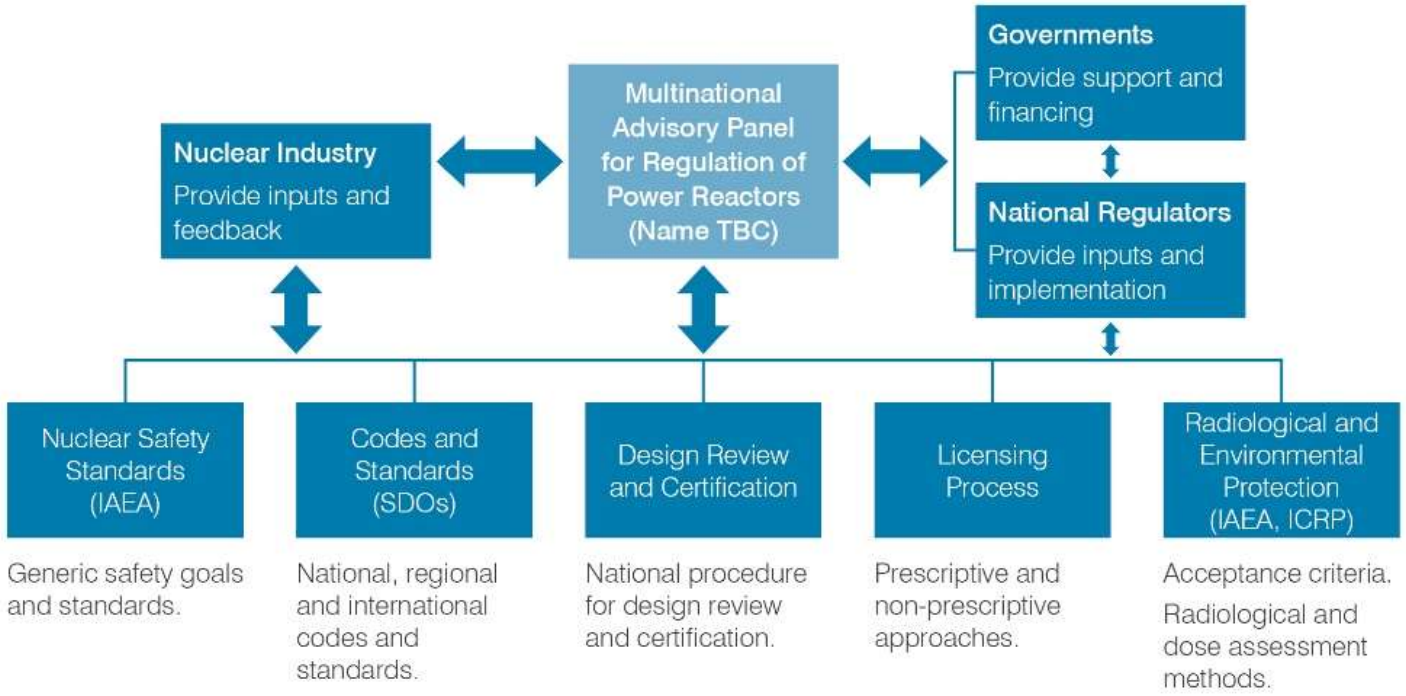
- Demonstrated need
- International cooperation
- Pragmatism

Benefits

- Common understandings
- Safety enhancement
- Efficient and effective licensing

A new approach for reactor design evaluation and licensing

- Sustained government support
- Regulatory cooperation
  - Harmonized terms
  - Codes and standards
  - Quantitative requirements (technology specific)
  - Licensing processes
- Industry engagement



www.world-nuclear.org

Ms. Jennifer NUGENT

Head of Technical, and Member of the International Nuclear Services (INS) Executive Team

Jennifer Nugent

SESSION 4. The international licensing system for transportation of nuclear material: a success story and a look to the future

We need to consider Transport at each stage of the lifecycle of any innovation, this could be at the outset of Lab samples, Prototypes, fleet manufacture, operation and disposal. Each stage will have its own challenges so needs to be considered early so that Transport is an enabler and not a constraint.

The challenges with harmonisation is ensuring consistency while recognising the Duty Holder. Interpretation or emphasis on regulations can differ between States therefore creating challenges to getting a Right first time safety case.

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Head of the Transport Safety Unit, United Nations International Atomic Energy Agency

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Future Challenge: Transportable Nuclear Power Plants (TNPPs)

Multi-sector workshop on innovative regulation: challenges and benefits of harmonising the licensing process for emerging technologies

OECD-NEA 14 – 18 December 2020

Stephen Whittingham
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Division of Radiation, Transport & Waste Safety
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Future Challenge:
Transportable Nuclear Power Plants (TNPPs)

There are two distinct regulatory frameworks one for NPPs and one transport of radioactive material in the public domain

Land Based
NPP / SMR

Individual Member State Approval / Licensing by National Regulatory Body
Includes goal orientated and performance based analysis to obtain authorisation to operate in compliance with national nuclear safety and security regulations

Global Transport Safety Infrastructure for Radioactive Material

Prescribed package types, performance-based package requirements, defined routine and accident conditions of transport, defined package authorization processes

Individual Member State Approval of Type BU Fissile package designs
Safety Requirements of transport package(s) and consignments must be independently verified by Member States through or into which the fissile radioactive material is transported

Future Challenge: TNPPs

The ambition would be to achieve similar levels of cooperation, collaboration and mutual trust in the transport safety of TNPPs as exists for radioactive material

A key objective to facilitate achieving this ambition, would be to develop a set of prescribed transport safety requirements that can be independently verified by a Member State within a global regulatory framework for transport, which will require mutual design approval of the TNPP by MS nuclear regulators

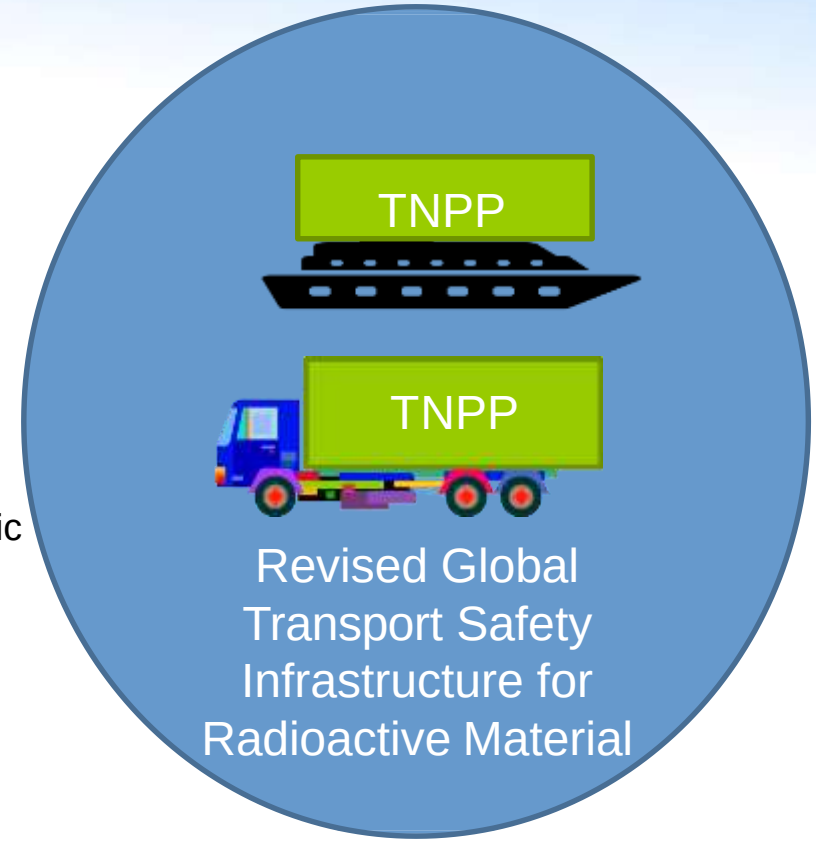
The main challenges would therefore be to reach Member State agreement:

- To characterise the transport safety features such that the IPR of the reactor design are not compromised
- To enable, and reach agreement with MS designing the TNPPs, that the design of the transport safety features are independently verifiable (validated)
- To develop prescribed administrative requirements for transport accordingly

In addition to transport safety regulations, International Conventions and Codes, for Safety, Security and Safeguards would also need to be reviewed and revised as considered necessary

The Future Challenge - TNPPs

The Member State regulatory framework will need to move into a revised global regime for transport in the public domain



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QUESTIONS FROM PARTICIPANTS

- Question 1
- Question 2
- Question 3

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MULTI-SECTOR WORKSHOP ON INNOVATIVE REGULATION

Challenges and benefits of harmonising the licensing process for emerging technologies

Thank you for your participation today and see you all tomorrow!