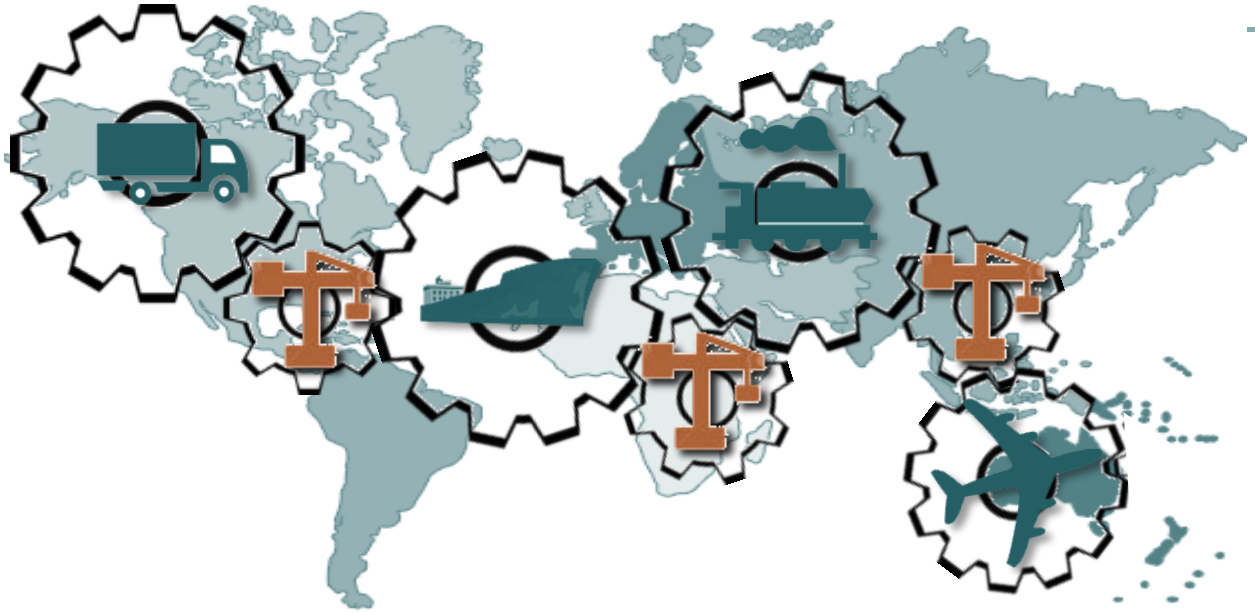

Licensing Transboundary Shipments of RR SNF

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Content

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Introduction

- Requirements for transboundary shipments of RM

Requirements for transboundary shipments of RM

International Conventions

- Dangerous goods transport
- Physical protection of NM
- Nuclear liability
- Nuclear accident or radiological emergency
- Safeguards
- Non-proliferation of WMD
- Suppression of acts of nuclear terrorism
- Safety of SNF and RW management

Specific International Standards and Guides

- RM transport
- Nuclear safety
- Radiation protection
- Radiological safety of equipment
- Design
- Fabrication
- Quality management
- Export
- Safeguards
- Physical protection
- Emergency preparedness

National Regulatory Basis

- Specific implementation of the above
- Administrative regulations
- Gov-to-Gov agreements

2

Examples of RR SNF transboundary shipments

- Long route land/sea shipments
- Type B air shipments
- Type C air shipments

Long route land/sea shipments





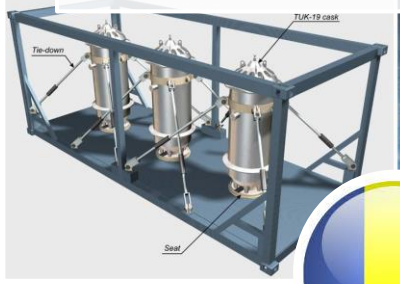

- 8030 SFAs leaking due to corrosion, repackaged in untight canisters
- Two certificates of approval for package design and shipment of SKODA VPVR/M and TUK-19 respectively (Type B) by road, sea and railway

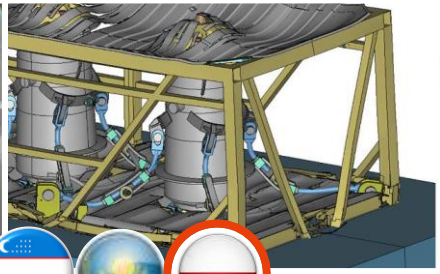
- 14 ISO-Containers (20ft) containing 16 TUK-19 and 16 SKODA VPVR/M packages
- 34 days / route length 12 500 km / real distance (bird's eye) ~ 3095 km (25%)
- Loading on trucks in Vinca (near Belgrade) / road shipment in Serbia / reloading on railway at the border with Hungary / railway shipment in Hungary and Slovenia / reloading on sea ship in Koper Port / sea and ocean shipment to Russia / reloading on railway in Murmansk Port / Railway shipment in Russia to Mayak PA

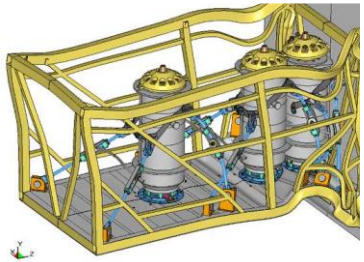
Consignor	Railway station	Port	Port Murmansk	Radiochemical plant
Loading ISO-containers onto trucks	Reloading ISO-containers onto flat railcars	Reloading ISO-containers onto seagoing vessel	Reloading ISO-containers onto flat railcars	Receipt of SNF packages in ISO-containers

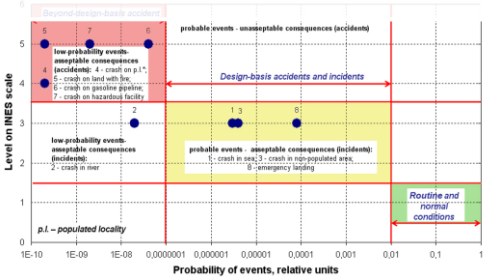
Type B air shipments

- Activity less than 3000 A2 per package, additional safety analysis (a group of packages at 90 m/s, air shipment risk assessment)
- Certificates of approval for package design and shipment of TUK-19 (Type B) by road and air









- 6 ISO-Containers (20ft) containing 18 TUK-19
- 4 days / route length 3 250 km / real distance (bird's eye) ~ 2 750 km (85%)
- Loading on trucks in Magurele (near Bucharest) / road shipment to airport / reloading to aircraft at Romanian airport / air shipment over Romania, Black Sea, Russia (avoiding transit countries) / reloading on trucks at Russian airport / Road shipment in Russia to Mayak PA
- No crane required in airports

Consignor	Airport	Airport	Radiochemical plant
Loading ISO-containers onto trucks	Reloading ISO-containers into aircraft	Reloading ISO-containers onto trucks	Receipt of SNF packages in ISO-containers

Type C air shipments

- No activity restrictions, 90 m/s impact test

- One certificate of approval for road shipment of SKODA VPVR/M (Type B)
- One certificate of approval for combined road and air shipment of TUK-145/C (Type C)

- 1 TUK-145/C
- 4 days / route length 11 238 km / real distance (bird's eye) ~ 6 350 km (56,5%)
- Loading on trucks in Dalat / Type B road shipment to airport / forming Type C package and reloading to aircraft at Vietnamese airport / air shipment to Russia (minimizing transit countries) / reloading on trucks at Russian airport / Type C road shipment in Russia to Mayak PA
- Crane required in airports

- Single certificate of approval for combined road and air shipment of TUK-145/C (Type C)

- 2 TUK-145/C
- 4 days / route length 3 250 km / real distance (bird's eye) ~ 3 100 km (95%)
- Loading on trucks in Budapest / Type C road shipment to airport / reloading to aircraft at Hungarian airport / air shipment to Russia / reloading on trucks at Russian airport / Type C road shipment in Russia to Mayak PA
- No crane required in airports

Consignor	Airport	Airport	Radiochemical plant
Loading ISO-containers or TUK-145/C onto trucks	(Forming Type C package) Reloading into aircraft	Reloading Type C package onto trucks	Receipt of SNF packages

3

Regulatory challenges and advantages

- Long route land/sea shipments
- Air shipments

Long route land/sea shipments

Challenges:

- Package design multilateral approval certificate in all transit countries
- Shipment certificate in all transit countries
- Supplementary regulatory requirements for transit countries (e.g. European Directive 2006/117 on the supervision and control of shipments of radioactive waste and spent fuel)
- Big number of carriers and reloading points (ports, railway stations) required to have licenses for handling dangerous goods
- Shipment surveillance
- Physical protection

Advantages:

- Proven experience
- Routes used before
- Packages used before
- Less number of shipments for big SNF quantities
- Shipment coalitions possible

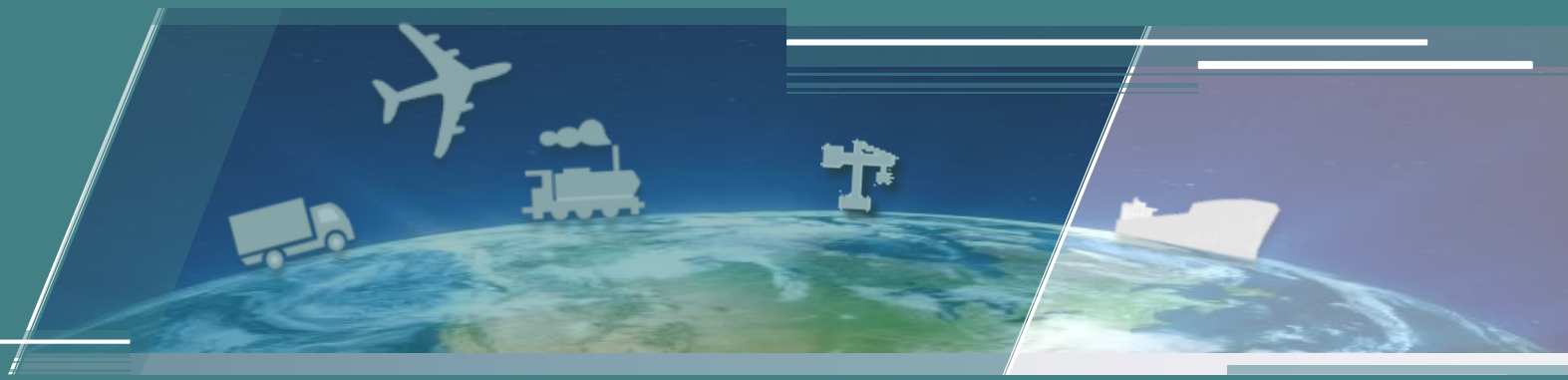
Air shipments

Challenges:

- Supplementary regulatory requirements for air shipments:
  - Special arrangement ⇒ Compensatory measures
  - SFRM/Type B ⇒ Restriction on activity per package
  - Type C ⇒ Enhanced thermal test (exposure for 60 min), impact at 90 m/s
- Sometimes regulatory requirements exceed the IAEA SSR-6 scope
- Quality assurance of airlines
- Limited availability of airlines/aircraft having the required capacity, licensed for DG/RM/SNF shipments
- New transport equipment

Advantages:

- Package design multilateral approval certificate not required for overflying the territory of a country
- Shipment certificate not required for overflying the territory of a country
- Shipment small duration
- Less physical protection efforts
- Flexible route to avoid transit countries and shipment in the proximity of high density population, environmental protected areas, nuclear objects, conflict areas



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Conclusions

Conclusions

- Air shipments are recommended to be used in projects associated with the management of research reactor nuclear fuel for schedule optimization, physical protection improvement, and to overcome route restrictions.
- Long route land/sea shipments are recommended to be used in projects associated with the management of research reactor nuclear fuel for the optimization of the number of shipments in case of big quantities, in case shipment coalitions are possible or if certificates/licenses were already issued for the given transport technology.
- The regulatory requirements have a big impact on the project planning and implementation.
- Each SNF shipment is unique and all advantages and disadvantages of possible solutions must be assessed in advance.
- There is no perfect solution, but thorough safety assurance lowers any risks.
- All the challenges can be overcome by good cooperation of the involved countries, authorities, and experts that contribute to the project.
- Programs like the RRRFR or the FRRSNF have become catalysts for the improvement of the cask handling procedures, development of equipment for loading SFAs into the casks, and the use of new transport modes and routes.
- The experience gained and the engineering solutions implemented during the RRRFR program have significantly extended capabilities for RR SNF transportation to Russia.

Thank you for your attention!

Questions?

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