Regulatory framework used in France for the transport of radioactive material: application to the transport by road of a thermoelectric generator equipped with a Strontium 90 radioactive sealed source (RTG) of Russian design (activity of 15 000 TBq)

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1- French regulatory framework used in France for the transport of radioactive material

1-1: Transport regulations

The French regulatory framework used in France for the transport of radioactive material consists of several documents (laws, decrees, technical rules), which are directly issued from the following documents:

- IAEA safety guidance TS – R –1 "Regulations for the safe transport of radioactive material",
- United Nations recommendations on the transport of dangerous goods

Modal regulations (International Maritime Dangerous Goods Code (IMDG) for the transport by sea, Regulations concerning the International carriage of dangerous Goods by rail (RID) for the transport by road (ADR) and International Civil Aviation Organisation Technical Instructions (ICAO))

- French decrees

1-2: Emergency preparedness

Concerning the emergency preparedness in case of an accident involving a package containing radioactive material, France has established specialised emergency plans called "PSS-TMR" plans at "departemental" (local) and national level *(the French territory is divided in 90 "départements"; in each département" a "préfet" is the local representative of the French government).*

The "PSS-TMR" plans have been reviewed recently according to guidelines issued in 2003 by the ministry of interior and the directorate for civil security with the participation of the ministry for defence.

1-3: Security and physical protection

Concerning the measures to be taken in order to prevent any misuse or theft of the RTG, one should refer to chapter 1-10 "Security provisions" of the ADR European agreement (new chapter in the version applicable on 1 January 2005) § 1-10.3 "Provisions for high consequence dangerous goods".

According to this document,

" consignors and other participants involved in the transport of high consequence dangerous goods shall adopt, implement and comply with a security plan that addresses at least the following elements:

a) specific allocation of responsibilities for security to competent and qualified persons with appropriate authority to carry their responsibilities,

b) records of dangerous goods or types of dangerous goods concerned,

c) review of current operations and assessment of security risks including any stops necessary to transport operation, the keeping of dangerous goods in the vehicle, tank or container before, during and after the journey and the intermediate temporary storage of dangerous goods during the course of intermodal transfer or transhipment between units,

d) clear statement of measures that are to be taken to reduce security risks, commensurate with the responsibilities and duties of the participant, including:

- *training,*
- *security policies (e.g. response to higher threat conditions, new employee/employment verification, etc.),*
- *operating practices (e.g. choice/use of routes where known, access to dangerous goods in intermediate temporary storage (as defined in c), proximity of vulnerable infrastructure etc.),*

e) effective and up to date procedures for reporting and dealing with security threats, breaches of security or security incidents,

f) procedures for the evaluation and testing of security plans and procedures for periodic review and update of plans,

g) measures to ensure the physical security of transport information contained in the security plan,

h) measures to ensure that the distribution of information relating to the transport operation contained in the security plan is limited to those who need to have it. Such measures shall not preclude the provision of information required elsewhere in ADR.

…/…

Note: When appropriate and already fitted, the use of transport telemetry or other tracking methods or devices should be used to monitor the movement of high consequence dangerous goods.

2- Implementation of the French regulatory framework for the transport of a RTG

2-1: Introduction

According to the experience of the process of decommissioning and dismantling of the RTGs, it appears that the RTG itself is used as "transport package" for the sealed source it contains from its actual location up to Moscow where the source is extracted from the RTG.

The transport is made partly by helicopter (cargo sling), partly by sea, partly by rail.

According to the IAEA safety standards and to the characteristics of the radioactive source, the RTG, considered as a transport package for radioactive material, must comply with the "type B" package specifications.

2-2: Compliance of the RTG with the specifications required for a type B package

According to the IAEA safety standards, which are applicable in France, the RTG must comply notably with following rules:

a) Radiological protection

- Surface contamination less than 4 Bq/cm2 for beta, gamma and low toxicity alpha emitters (0;4 Bq/cm2 for others alpha particles),
- Specific dose rate at contact, 1 m of the package and at contact and two meters of the vehicle,
- Depending on specific transport conditions : Dose rate at contact of the package 2 to 10 mSv/h, at 1 m from the package 0,1 mSv/h and at contact of the vahicule 2 mSv/h and at 2 meters from the vehicle 0,1 mSv/h. (The transport index is limited to 50 on a conveyance not under exclusive use. (sea IAEA TS-R-1 safety guidance § 526 and 527)).

b) Thermal protection

- External temperature less than 50°C (85°C acceptable with specific conditions of transport).

c) Design temperatures

- – 40°C up to 38°C and insulation

d) Resistance to accidents

The package must be able to support following aggressions:

- drop from 9 meters on a hard flat surface (drop test),
- drop from 1 meter on a steel bar 150 mm diameter (percussion test),
- after these two tests, fire at a temperature of 800°C during 30 mn,
- after these three tests, the leakage of radioactive material (Sr90) outside of the package must be less than 0,3 TBq/week and the external irradiation must be less than 10 mSv/h at a distance of 1 meter,
- immersion during 8 hours at a depth of 15 meters

Considering the transport by sea and the transport by helicopter above sea, it would be necessary to add specific additional measures.

2-3: Emergency preparedness and intervention in case of an accident (example of a road accident)

According to the French emergency plans for the transport of radioactive material ("PSS-TMR" plans), the intervention is conducted as follows:

1. in case of an transport accident on the road, the first rescue team will consist of the gendarmerie (policemen), of firemen or of a medical care unit; this team will assist the victims, secure the accident scene and make the first investigations; as soon as the presence of a package containing radioactive material is discovered, the "départemental" operational center of the firemen (CODIS) is informed;

2. the CODIS sends to the accident scene a specialised intervention unit (Mobile Team for Radiological Intervention or CMIR) and informs (preliminary alert) the local authority (the"Préfet"), the national authorities (Nuclear Safety Authority (General delegate for nuclear safety and radiological protection (DGSNR) if civil nuclear

material concerned, Delegate for nuclear safety and radiological protection for installations and activities concerning Defence (DSND) if military nuclear material concerned), CEA, IRSN, national operation center of the civil security) and if possible the consignor[1] and the carrier involved in the transport of the package;

3. the CMIR conducts the investigation and makes the first measurements; if a radiological emergency is established, the CMIR informs the CODIS which confirms the alert to the local and national authorities; if necessary, according to the information given by the CMIR, the local authority takes the first immediate measures for the security of the population.

4. At national level, a first quick assessment is conducted by the Competent Authorities with the technical assistance of IRSN (and the experts of the Safety of Plants, Laboratories, Transport and Waste Division) and if possible of the consignor and the carrier involved in the package transport. If possible the intervention team of the IRSN (and/or a specialised team of CEA) is sent to the accident scene and the Technical Crisis Center of the IRSN (CTC) is activated.

5. According to the information given firstly by the CMIR, then by the intervention team of the IRSN (and/or of CEA) and to the knowledge of the package involved in the accident (status, data given by the consignor and the carrier, data extracted from the national information data base on radioactive sources SIGIS), the "Préfet" decides to implement fully the TMR emergency plans at national level (organisation similar to that implemented in case of a nuclear accident in a nuclear installation). On the accident scene, the CMIR, the intervention team of IRSN (and/or of CEA), and additional means depending on the need, take the necessary measures to recover the radioactive source, to clean the contaminated area and to rescue contaminated and/or irradiated people; the "Prefet" takes the necessary measures for the security of the population.

2.4: Physical protection and security of the RTG during transport

Physical protection of the RTG and security measures in order to prevent any misuse of the RTG (for example use of the sealed source for the manufacturing of a “dirty bomb” by terrorists) must be implemented.

One should refer to the security provisions of the ADR (as applicable from 1 January 2005, see chapter 1, § 1.3 of this document); the transcription of these security provisions in the French regulatory framework is underway.

NOTA: For additional information, one could contact following people in IRSN:
In the Safety of plants, laboratories, transports and waste division: marie-therese.lizot@irsn.fr or sophie-lemao@irsn.fr.
In the Environment and response division: lionel.dewiere@irsn.fr,
In the Radiation protection of the human being division: hilaire.mansoux@irsn.fr,
In the Defence nuclear expertise division: bernard.autrusson@irsn.fr.

[1] Consignor means the enterprise which consigns dangerous goods either on its own behalf, or for a third party. If the transport is carried out under a contract for carriage, consignor means the consignor according to the contract for carriage.