



## **INES scale : French application to radioactive material transport**

Séverine SOWINSKI, Sophie STRAWA and Jacques AGUILAR

Direction générale de la sûreté nucléaire et de la radioprotection  
Fontenay-aux-Roses FRANCE

### **Abstract**

After getting the control of radioactive material transport in June 1997, the French safety Authority (ASN) decided to apply the INES scale to transport events.

DGSNR (Directorate General for Nuclear Safety and Radioprotection) requests that radioactive material package consignors declare any event occurring during transportation, and has introduced the use of the INES scale adapted to classify transport events in order to inform the public and to have feedback.

This paper deals with DGSNR's feedback during the past seven years concerning the french application of the INES scale. Significant events that occurred during transportation are presented.

The French experience was used by IAEA to develop a draft guide in 2002 and IAEA asked countries to use a new draft for a trial period in July 2004.

### **HISTORICAL BACKGROUND**

In the same way as for natural phenomena such as earthquakes, wind or avalanches, France set up in 1987 a scale measuring the degree of seriousness of nuclear-related events. The Organisation for Economic Cooperation and Development (OECD) first of all, and then the International Atomic Energy Agency (IAEA) made extensive use of it when putting together the INES scale.

The INES scale was internationally implemented in 1991. Following a recommendation made in France by the high council for nuclear safety and information (CSSIN), the INES scale was adopted by the Nuclear Safety Authority (ASN) in April 1994. This scale is now applied to all the installations controlled by the ASN (EDF reactors, COGEMA plants, laboratories of the Atomic Energy Commission, etc.).

However in the early 90s, the INES scale was in reality applied only to nuclear facilities and not to transport events. This situation can perhaps be explained by the small number of transport incidents which were actually notified to the authorities and by the absence of precise rules for use of the INES scale in this type of incident.

The late 90s saw several significant transport-related events : contamination from spent fuel convoys made a deep impression internationally on public opinion and the media, forcing the authorities to react.

Expanding the scope of its activities to include controlling the safe transport of radioactive materials, the ASN then decided to apply the INES scale to transport events, following a wide debate bringing together experts, industry and the high council for nuclear safety and information (CSSIN).

International interest in French experience has gradually raised the question of harmonised application of the INES scale to transport events by the competent international authorities.

### **THE APPLICATION OF INES SCALE TO TRANSPORT EVENTS**

The criteria for application of the INES scale to transport had to be drawn up on the basis of three objectives : ease of use, consistency with the general principles of the INES scale and inclusion of the data and examples concerning transport contained in its application manual, and finally production of a balance of past incidents/accidents with a view to subsequent rating.

In order to study the scope of the events to be included, the ASN asked all those involved in the transport chain to declare events, incidents or accidents of any kind which occurred during their transport in France.

On the basis of this information, technical discussions were held with the consignors and forwarding agents, in order to define the criteria for declaring incidents to be rated on the INES scale.

At the same time, at the instigation of the IRSN, the ASN drew up a project to apply the INES scale to radioactive material transport events. In 1998, the chairman of the CSSIN decided to create a working group to examine the project produced by the ASN. This working group consisted of CSSIN members, information and communication specialists, environmental protection associations, operator representatives, administrators, and radioactive material transport experts. The working group examined the INES scale project on the basis of a number of incidents and accidents that had occurred in recent years.

Following this wide consultation, it was decided to apply the INES scale to radioactive material transport events during a one year trial period.

**Evolution of the number of transport events notified between 1999 and 2003**

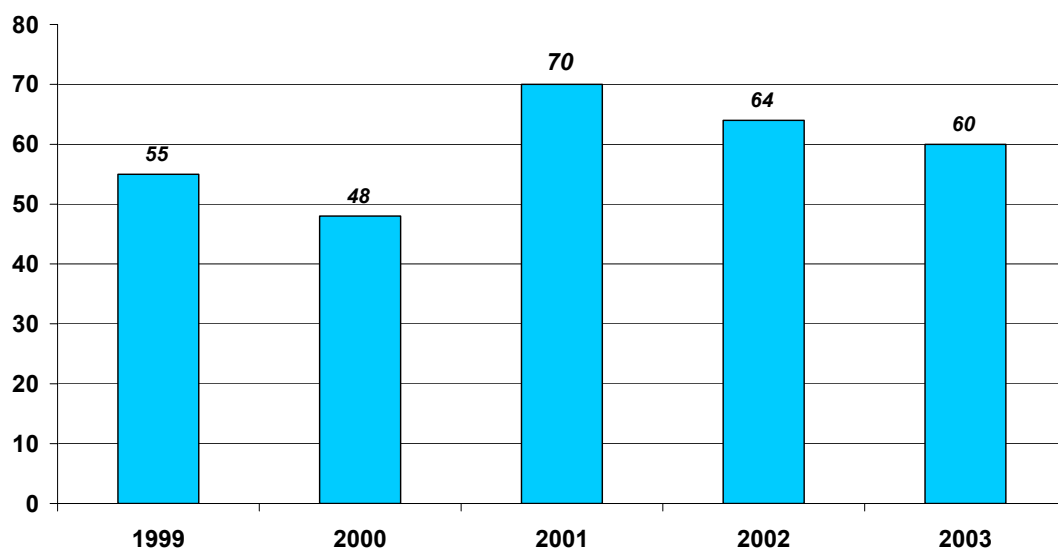


Figure 1 : Notified events since 1999

### **The test phase**

The experimental period began in 1999. The nuclear safety authority felt that the system adopted for the trial period led to no major problems for rating of these incidents. Nonetheless, certain minor adaptations were proposed in order to reinforce the clarity and consistency of the system. These adaptations in particular concern incidents involving industrial or fissile packages, loss of radiation sources and nonconformity with the regulations concerning documentation or reporting, along with clarification of the level of impairment of the safety functions in the event of defence in depth being degraded.

After this year the CSSIN urged the ASN to implement the INES transport scale. On 11 April 2001, this implementation was confirmed by a decision of the ASN.

### **Public Information**

The arrangement to inform the public and media is the following : all events rated at the level 1 are systematically mentioned on the ASN web site ([www.asn.gouv.fr](http://www.asn.gouv.fr)) with a short explanation notice of what happened and what were

the consequences, and some of the events rated at level 0 are also mentioned on the web site depending of the possible interest of the public and media. With respect to IAEA, the events rated at level 2 and higher are systematically reported to IAEA, but some events rated at a level lower are also reported to IAEA, in particular concerning loss of source near borders.

### RESULTS SINCE 2000

In 2000, 55 radioactive material transport incidents were rated on the INES scale. 24 of these incidents were rated at level 1 and none was rated at a higher level.

In 2001, 70 events were rated, including 18 at level 1. No incident was rated at a higher level.

In 2002, 63 events were rated, including 50 at level 0, 12 at level 1 and one was rated at level 3 by the Swedish Authority.

In 2003, 60 events were rated, including 50 at level 0, 10 at level 1. No incident was rated at a higher level.

The following graph shows the rated incidents trend since 2000. The change in the number of events rated at level 1 between 2000 and the following years is explained by a change in the criteria used to rate the events. These new criteria are more close to the draft guide proposed by IAEA at the TRANSSC meeting on February 2002. The trend in the number of incidents/accidents reported during the last 3 years is stable.

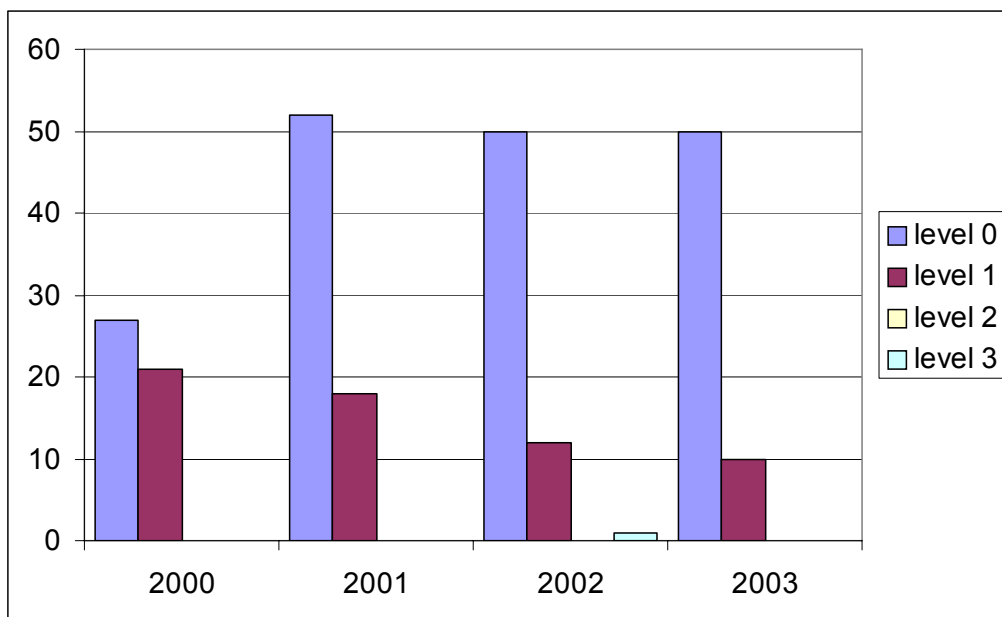
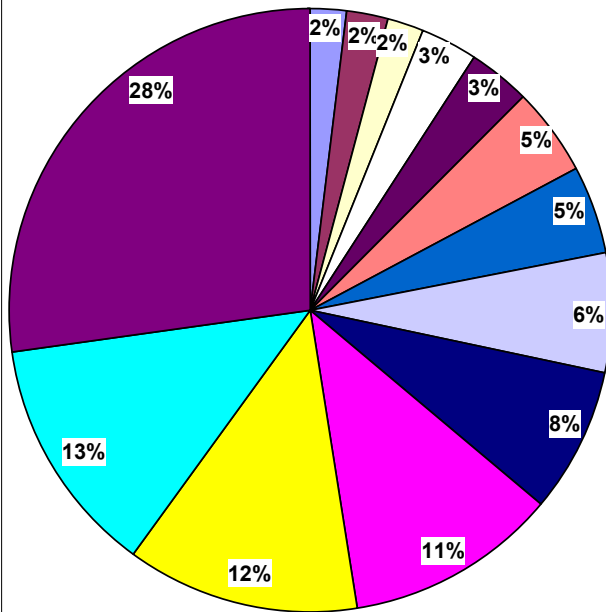


Figure 2 : Number of transport events rated on INES in France

The following graph shows distribution by kind of events since 1999. Four types of events are prevailing : excessive contamination, inadequate documentation or signalisation, non compliance with regulation and damage during transport or handling at an airport. This last kind is essentially due to a bad stowing on the pallet.

- Accident during rail transport
- Damage during transport or handling
- Lost & found packages
- Accident during road transport
- Bad stowing
- Excessive dose rate
- Others
- Loss of containment or inadequate packaging
- Violation of approval
- Excessive contamination
- Inadequate documentation or signalisation
- Non-compliance with regulation
- Damage during transport or handling at an airport

**Type of incidents - période 1999-2003**



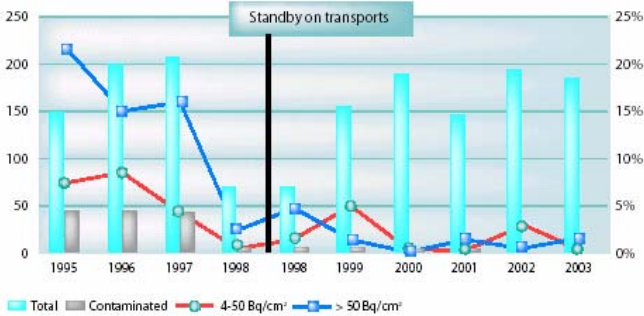
**SIGNIFICANT EVENTS IN 2003**

**Contamination of spent fuel convoys**

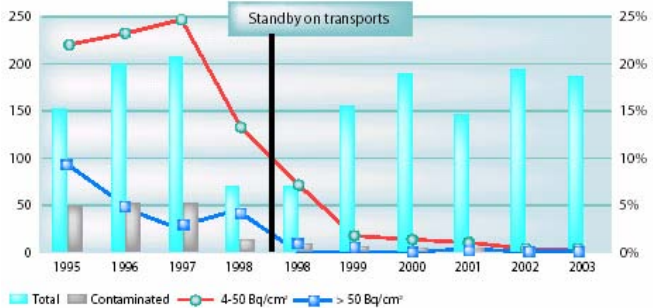
Transport of spent fuel from the EDF sites to the COGEMA La Hague site continued now with no significant incident. The contamination problems experienced in the past have been solved due to the efforts made by the EDF sites and ASN supervision. The ASN remains vigilant and continues to closely monitor the conditions in which these transports take place.

Spent fuel is continuing to be transported normally from foreign countries to La Hague and to Sellafield (UK).

Package contamination Results in 2003



Wagon and trailer contamination Results in 2003



## Airport handling incidents

In 2003, 20 incidents of this type were identified at Roissy-Charles-de-Gaulle, Orly and Lyon-Saint-Exupéry airports. These incidents concerned type A or excepted packages, which were damaged to varying extents.

Jointly with the DGAC (civil aviation authority) and the air transport police the ASN carried out a number of air cargo inspections. The transporters were reminded of the need to implement a radiation protection programme appropriate to the transport activities, to correctly secure the packages and make the personnel aware of the hazard of ionising radiation.

### *Contamination in an air cargo warehouse*

On 15 October 2003 in Roissy airport, an excepted package loaded with radioactive material fell off the pallet, to which it was not secured, and was crushed by a fork-lift truck. The package was completely crushed, leading to leakage of the radioactive content. It contained a few millilitres of iodine 125, with an activity of 111 kBq. The area was cordoned off and radiological measurements confirmed the presence of highly localised contamination of an area of about twenty square centimetres : decontamination took place the following day, by removal of material. Resulting measurements revealed no trace of contamination of the personnel who had been in contact with the crushed package. This incident was ranked level 1 on the INES scale.

### *Contamination of a service road at Roissy airport*

On the night of 27 to 28 November 2002, an excepted package loaded with radioactive material fell off its lorry and was crushed by the following lorries. The package was totally crushed on a Roissy airport internal service road, leading to leakage of the radioactive liquid it contained, which was 106 MBq of iodine 125 in 204 bottles intended for medical use. A safety perimeter was established around the area. Radiological measurements confirmed the presence of several contamination spots over a distance of about forty metres. The following day a specialist company carried out decontamination by removal of material. Measurements revealed no trace of contamination of the personnel who had been in contact with the crushed package. The package and its content were repackaged and then stored at Saclay before being returned to the consignor. This incident was ranked level 1 on the INES scale.

## Incidents and accidents during actual transport

### *Bad stowing*

Slippage of three packages, with one of them falling and tipping over into the transport trailer. During transport of contaminated tools, placed in type A packages, three poorly secured packages slipped in the lorry trailer. One of them tipped over and fell. The retaining straps were not attached to anchor points. Nonetheless, the containers remained closed and showed no signs of impact or deformation. Radiological surface contamination and dose rate measurements were below regulation limits. A new packing plan was implemented and the convoy dispatched again. This incident was ranked level 0 on the INES scale.

The importance of stowing and securing packages during all stages of the transport process was described in a circular letter sent out by the ASN on 10 September 2003 to all consignors and carriers.

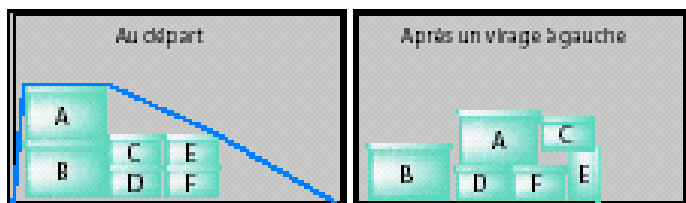


Diagram showing poor stowage

### *Loss of an excepted package between Saclay (France) and La Habana (Cuba)*

On July 17 2004, an excepted package containing radioactive material has been lost during its transport between Saclay (France) and the consignee located in La Habana (Cuba). The French authority was informed on July 30 of this event. Due to the estival period, the discovered loss took more time than normal. This package contained a limited quantity of Iodine 125 (a total of 1.43 MBq). The competent authority of France informed the competent authority of Cuba. Due to the loss of this radioactive package, the competent authority of France rated this event at level 1 on the INES scale.

### *Theft of two low activity radioactive sources in Palaiseau*

The French Nuclear Safety Authority (ASN) was notified on June 14<sup>th</sup> 2004 about the theft of two portable devices for detecting lead within paintwork each of them containing a low activity Cobalt 57 source. These devices were stolen in Palaiseau (South of Paris) during a transportation, just before their delivery. The lorry carrying them was entirely cleaned out of its load following an armed robbery. The ASN has rated this event at level 1 on INES scale as applied to the transportation of radioactive material.

## **INTERNATIONAL SHARING OF FRANCE'S EXPERIENCE**

### **Changes to the IAEA's INES User Manual**

Application of the INES scale to transport in France was transmitted for information to the foreign safety authorities competent in the transport area and to the International Atomic Energy Agency. Although the scale was not specifically designed for application to the transport of radioactive materials in general, information about rating events occurring during transport is given as of the 1993 edition of the INES User Manual. In 2001, the IAEA and the Nuclear Energy Agency of the OECD (NEA) published a revision of the INES User Manual, with more information about the rating of transport incidents. The system put in place in France, for which the operating procedure is nonetheless more detailed than the manual, takes account of these changes.

### **The initiative of the European Commission**

In June 2001, the European Union organised a meeting for an exchange of views by the European authorities concerning application of the INES scale to radioactive material transport events. The European Commission consulted the Member States over the application protocol draft prepared during this meeting. International agreement on application of the INES scale to transport is thus probable in the medium term. During the last meeting of the Standing working group on transport in October 2002, the EU proposed a draft of a directive or a regulation for notification and rating of transport events.

### **The initiative of the International Atomic Energy Agency**

The document discussed at European level was forwarded to the IAEA, which recognised the need for further development of the INES scale applied to transport. The Agency therefore in December 2001 organised a consultants meeting (CSM) to propose additions to the scale. Experts from Belgium, France, the United Kingdom and the United States all contributed to this CSM. After approval by the Agency, the draft guide was proposed during the TRANSSC meeting in February 2002 for a trial period.

The final draft of the INES additional guidance for the rating of transport of radioactive material and radiation source events was agreed during the last technical meeting of the INES national officers on March 2004 and was sent in June 2004 for a trial period.

Subsequently, this information could then be included in a future revision of the INES User Manual.

## **CONCLUSION**

Notification and rating transport events on the INES scale is a good way to inform the public and media on what happens in transport of radioactive materials. This is also a good tool to share experience with other countries. Now, some countries are using the INES scale to rate radioactive material transport event. This is an important progress to share experience on transport events and to give better and clearer information to the public