

Emergency preparedness and response

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1. Introduction

Nuclear power has been providing clean, affordable electricity in many parts of the world for nearly half a century. The national and international transport of nuclear fuel cycle materials is essential to support this activity. To sustain the nuclear power industry, fuel cycle materials have to be transported safely and efficiently. The nature of the industry is such that most countries with large-scale nuclear power industries cannot provide all the necessary fuel services themselves and consequently nuclear fuel cycle transport activities are international.

2. An outstanding safety record

The radioactive material transport industry has an outstanding safety record spanning nearly 50 years. Safety is assured through a tight nuclear safety regulatory framework, and the commitment and professionalism of industry-which clearly has a vested interest in assuring safety. This is an enviable record in the annals of dangerous goods transport; but one that must not be taken for granted.

2.1 How is safety assured?

First of all, it is accepted internationally that safety is vested primarily in the package that actually contains the radioactive material - not in the transport conveyance, whether it be a ship, truck, train or airplane. Of course account is taken of the particular means of transport, which has the effect of contributing to a safety in depth in the event of an accident. The packaging requirements, in turn, are determined on the basis of the degree of risk related to the actual properties of the materials the packages are to contain.

2.2 How are such materials packaged to assure safety?

The robustness of the packaging is determined by the risk factors related to the properties of the material the packages are to contain. The design and performance standards for packages used for the transport of radioactive materials are defined in the International Atomic Energy Agency (IAEA) Regulations for the Safe Transport of Radioactive Materials - also known as TS-R-1.

There are various categories of packages used to transport nuclear fuel cycle materials. Industrial Packages are used for low specific activity materials, typically, uranium concentrates or low-level waste, which can be safely transported in sealed 210 litre drums packed into a standard transport container. Type A packages are used typically for new, or fresh fuel. HEX is transported in steel cylinders. Type B packages are high duty packages which are used for the transport of some of the more radioactive nuclear fuel cycle materials, notably spent nuclear fuel, high level wastes and mixed oxide fuel.

These packages are tested to prove their capabilities, in the face of actual transport conditions, including possible accidents. For instance, for Type B packages, which are used for the most hazardous materials such as spent fuel and high-level wastes, the regulations require a demonstration of the successful performance of the package in impact tests relevant to crashes, thermal tests which simulate fires and water immersion tests relevant to an accident at sea.

The IAEA tests are severe and cover all accident situations which realistically can be envisaged in the transport of fuel cycle materials. The IAEA regulatory regime has ensured safety under both normal and accident conditions of transport for many years. There is a large body of analytical and experimental evidence to support the fact that the current IAEA test requirements meet this criterion.

However enviable is the record in the annals of dangerous goods transport; it is one which must not be taken for granted. Efficient emergency preparedness and response in the transport of radioactive material is an important element to ensure the maximum safety in accident conditions.

3. The IAEA approach on emergency response

The International Atomic Energy Agency, through the IAEA Regulations for the Safe Transport of Radioactive Material, the so-called TS-R-1, requires countries to develop emergency capability. The emergency provisions also form part of the Competent Authority approval certificates.

3.1 IAEA TS-G-1.2

A guidance document, IAEA Safety Guide TS-G-1.2, “Planning and preparing for emergency response to transport accidents involving radioactive materials” completes the transport regulations requirements. It provides guidance on various aspects of emergency planning and preparedness for dealing effectively and safely with transport accidents involving radioactive material, including the assignment of responsibilities. It reflects the requirements specified in Safety Standards Series No. TS-R-1 (ST-1, Revised), Regulations for the Safe Transport of Radioactive Material — 1996 Edition (Revised) (2003) and those of Safety Series No. 115, International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (1996). It describes the framework and responsibilities for planning and preparing for response to accidents in the transport of radioactive material transport. The TS-G-1.2 safety guide is currently considered for review by the IAEA.

3.2 The International Nuclear Events Scale

The International Nuclear Events Scale (INES) is used for facilitating rapid communication to the media and the public regarding the safety significance of events at all nuclear installations associated with the civil nuclear industry, including events involving the use of radiation sources and the transport of radioactive materials. Events are classified on the scale at seven levels: levels 4–7 are termed “accidents” and levels 1–3 “incidents”. Events without safety significance are termed “deviations” and are classified below scale at level 0. Events without relevance to radiological or nuclear safety are termed “out of scale”. With the assistance of the Swedish Government, the IAEA has developed a data input programme that Members States can use in preparing data for the database on

Events in the Transport of Radioactive Material (EVTRAM). The feedback on this data base is very low and every year, the IAEA General Conference Resolution requests Members States to collaborate in maintenance of up-to-date data bases.

The INES Manual was adopted in July 2008 and should be published soon.

3.3 Conventions on assistance and early notification

The Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency and the Convention on Early Notification of a Nuclear Accident, also called Emergency Conventions, are the prime legal instruments that establish an international framework to facilitate the exchange of information. They place specific obligations on the Parties and the IAEA, with the aim of minimising consequences for health, property and the environment.

4. The WNTI surveys

The World Nuclear Transport Institute (WNTI) was founded in 1998 by International Nuclear Services (INS) of the United Kingdom, Areva of France, and the Federation of Electric Power Companies (FEPC) of Japan to represent the collective interests of the radioactive materials transport sector, and those who rely on safe, effective and reliable transport. WNTI has grown dramatically representing forty-eight member companies drawn from a wide range of industry sectors, including major utilities, fuel producers and fabricators, transport companies, package producers, and the production and supply of large radiation sources.

As part of its activities, WNTI has conducted two surveys among its members on emergency preparedness and response in the transport of radioactive material and emergency exercises.

4.1 WNTI Emergency Response Questionnaire

A questionnaire, sent to WNTI members sought information on each country’s regulations in relation to emergency response. These regulations can be more compliant with TS-G-1.2 or develop a specific guidance on the planning and preparing for emergency response. Members were also asked to provide information on the regulations, the emergency preparedness in place and the emergency response organisation (who and how). The answers received give a large spectrum of the emergency response and preparedness in various regions of the world.

From the answers received one could draw the following conclusions.

4.2 Main conclusions of the Emergency Response Survey

The emergency planning and preparedness in place in each country surveyed can be quite different as it is particularly dependent on the type of nuclear activity carried out by the country, the means of transport, the State organisation. The level of definition of the emergency plan is different when the country is solely producing uranium ore concentrates or when the country has a sophisticated nuclear infrastructure providing more types of activities including, for instance, power plants and conversion facilities. The organisation of the State itself and level of centralism has also an important influence on emergency planning. The planning is different if the State is centralised or if it is federal. However a central law is always present.

Country regulations always follow the relevant emergency preparedness and requirements for modal regulations, as these are mandatory. They include the relevant sections of the International Maritime Dangerous Goods (IMDG) Code, and the International Civil Aviation Organization and International Air Transport Association regulations. The IAEA TS-G-1.2 guidance appears to be followed by countries with only a few exceptions, even though there may not be direct mention of TS-G-1.2 in the law. It can be noted that a trans-national initiative exists between Argentina, Canada, Mexico and the United States and is applied through the edition of the “2004 Emergency Response Guide Book” for transport incidents involving dangerous goods.

At local level, there is usually a need for interface between federal and local laws and administrations, especially if the State is federated. However, in one way or another, local rescue organisations such as fire or police services are always involved.

The organisation of emergency response appears to be the area of greater difference between the various countries studied, as it is highly dependent on the level of centralism of each State. The responsibility for public safety, recovery and remediation is very different from one country to another. However, it always involves the local emergency services. Industry is usually involved only on request from the authorities.

4.3 WNTI Emergency Exercise Questionnaire

More recently, the World Nuclear Transport Institute decided to survey its Members on the organisation of emergency exercises. This questionnaire led to the organisation of a dedicated workshop which took place last year in Saint-Petersburg, Russia, where participant WNTI member companies shared their experiences on emergency exercises. The questionnaire required information on the organisation and frequency of the exercises as well as the lessons learnt from the exercises.

4.4 Main conclusions from WNTI Emergency Response Considerations

The main conclusions are as follows.

Exercises can take different forms: from a full scale exercise, usually organised once a year, to desktop exercises with a higher frequency of occurrence. They usually involve a large number of stakeholders, including industry. The organisation of the emergency response is an important element in the success of the emergency operation as numerous different emergency services and stakeholders are required to collaborate together, all bringing their own work habits and processes. Communication issues are, therefore, of major importance - for instance, the vocabulary needs to be understood equally by all parties involved. Emergency services also benefit from education on radio-protection, radioactive materials and associated risks.

Based on decades of experience, the likelihood of accidents remains very low. However, the industry is committed to ensuring, in the interest of maximum safety in accident conditions, that efficient emergency preparedness and response procedures in the transport of radioactive material, with regular well-prepared exercises, are in place.



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