DEVELOPMENT OF EMERGENCY ARRANGEMENTS FOR THE TRANSPORT OF RADIOACTIVE WASTE TO A DEEP REPOSITORY

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INTRODUCTION

UK Nirex Ltd (Nirex) has been set up by the UK Nuclear Industry to establish a deep repository for the disposal of low level (LLW) and intermediate level (ILW) radioactive waste arising in the UK. Nirex is also developing an integrated transport system for moving the waste from the sites at which it arises to the repository, including the design of suitable packages and the preparation of a plan for responding to accidents or other emergencies which might arise during the radioactive waste transport operation. This response known as a Transport Emergency Plan, will form part of the applications for transport package approval and is expected to be subject to examination at the Public Inquiry into the repository development.

Emergency Plans are already established in the UK to cover the transport of radioactive material by road and rail. However, none of the existing plans was designed to accommodate the proposed transport requirements for radioactive waste. AEA Technology has for many years provided advice and other input to legislation relating to the transport of radioactive materials, and was appointed to develop suitable emergency arrangements under contract to Nirex.

This paper summarises the results of this work, which was undertaken from first principles and involved the following sequential stages:

(i) Identification of all applicable legislation relating to requirements and recommendations for emergency arrangements for the transport of radioactive materials within the UK.

(ii) Development of a Planning Basis, as defined in IAEA Safety Series No 87 (IAEA 1988), from consideration of transport modes, types of packages to be used, and the potential consequences of transport accidents.

(iii) Production of an Emergency Plan Specification derived from the legal requirements, the Planning Basis and the recommendations in IAEA Safety Series No 87.

(iv) Comparison of existing Emergency Plans with the Specification; review of comments made during the development of existing Emergency Plans by the emergency services; and discussions with interested parties (eg waste producers and carriers) in order to determine the optimum Emergency Plan suitable for the proposed transport arrangements.

DEFINITION OF REQUIREMENTS

Under current proposals the transport of waste from arising sites to the repository will be by road and rail only. LLW will be transported in IP2 Industrial Packages and ILW will be transported in Type B packages or Industrial Packages, depending on the nature of the contents.

In order to define the legal requirements applicable to the proposed arrangements for the transport of radioactive waste within the UK, all legislation relating to the transport of radioactive materials was identified and examined. Since the waste repository will not be operational before the year 2005, the study also considered any additional legislation likely to come into force during the next decade.

All legislation concerning the safe transport of radioactive material within the UK reflects the Transport Regulations produced by the International Atomic Energy Agency (IAEA 1990). The Secretary of State for Transport is the Competent Authority in the UK and the executive role is carried out by the Department of Transport Radioactive Materials Division. There exists both general and mode-specific legislation to control potential radiation hazards during transport. All this legislation reflects the provisions of the IAEA Transport Regulations. The Regulations stipulate that emergency arrangements must be in place to ensure a suitable response by emergency services, carriers, consignors and local and national government agencies in the event of an incident involving the transport of radioactive material.

The consignor is required to ensure that general accident provisions are made for all packages. In addition, where packages or shipments need approval from the Competent Authority, including all Type B packages and packages for fissile material, the approval certificate must include details of these provisions.

Advice on emergency arrangements for radioactive materials transport is given in IAEA Safety Series No 87. However, the recommendations need to be interpreted in order assess what arrangements are suitable in a particular country, especially with regard to arrangements at a national level.

In addition, all work with ionising radiation in the UK, including the transport of radioactive materials, is subject to the Ionising Radiations Regulations (IRRs 1985) and an Approved Code of Practice (ACoP 1985). The IRRs comply with Euratom Directives and IAEA Safety Standards which are based on recommendations produced by the International Commission on Radiological Protection.

The IRRs require a contingency plan to be prepared to protect workers and members of the public in the event of a reasonably foreseeable accident which could give rise to significant exposure to radiation. Criteria are given for determining the need for a contingency plan, which are related to the hazard potential of the operation. The robustness of Type B packages is such that the hazard potential is limited and the criteria would not be exceeded. Therefore a contingency plan would not be strictly necessary. However, Industrial Packages are only required to withstand normal conditions experienced in transport. Assuming that the shielding would be lost from an Industrial Package and that its containment would be impaired in a reasonably foreseeable accident, then a contingency plan would be needed on the grounds of external radiation and/or release of activity for a proportion of the Industrial Packages that would be used for transporting waste to the repository.

In the context of European Directives and Regulations, there are two items of legislation currently applicable to the movement of dangerous goods:

(i) European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).

(ii) Convention concerning International Carriage by Rail, Appendix B, Annex 1 'Regulations concerning the international carriage of dangerous goods by rail (RID)'.

In neither of these documents is there any direct reference to the need for emergency arrangements. Provisions in respect of accidents are included, but these are based on the IAEA Regulations.

The main conclusions from the first stage of the study were:

(i) An Emergency Plan will be needed under the IAEA Regulations in order to obtain Type B package design approval. Although a Contingency Plan may not be strictly necessary under the IRRs, the Emergency Plan will effectively perform the same function.

(ii) A Contingency Plan will be needed under the IRRs for the transport of Industrial Packages.

PLANNING BASIS

As part of the work to develop the Planning Basis, the following information was determined:

(i) The average number of packages in each waste category (LLW or ILW) required to be transported from each arising site per annum.

(ii) The likely routes to be used for transporting waste to the repository by rail or road.

(iii) The likely frequency and severity of transport accidents involving waste packages, together with the associated (radiological) risk to members of the public. This information was derived from a Probabilistic Safety Assessment of the proposed transport arrangements.

An assessment was then carried out to complete the Planning Basis which established that:

(i) The frequency of an accident involving vehicles transporting waste packages is expected to be low.

(ii) In the vast majority of accidents involving radioactive waste packages, the increase in hazard arising from the radioactive nature of the package will be insignificant.

(iii) The estimated risk of premature death (due to radiological causes) to an individual member of the public from transport accidents involving radioactive waste is extremely low, even if no effective counter-measures are taken.

(iv) In all likely accident scenarios, the simple expedient of establishing a small exclusion zone around the damaged package will generally be sufficient to provide adequate (short-term) radiological protection to the public.

(v) Notwithstanding items (i) and (iv), it will be necessary to mobilise and despatch trained Health Physics personnel to the scene of an incident as soon as practicable, in order to confirm that no radiological hazard exists or to advise on any countermeasures required until removal of the package can be effected. Therefore a simple notification system and communications network must be in place and responding sites must be selected to provide good coverage of the transportation routes.

(vi) In the event of an incident in a remote and inaccessible region it may be necessary to make special arrangements (eg helicopter transport) in order to achieve an appropriate response.

EMERGENCY PLAN SPECIFICATION

Based on the conclusions of the Planning Basis, and the advice on emergency arrangements given in IAEA Safety Series No 87, a specification for the production of an Emergency Plan which meets the legal requirements of both the IAEA Regulations and the IRRs was produced. However, in order for the resulting Plan to be viable, it was recognised that it must be acceptable to those organisations likely to be involved in its approval, organisation and implementation. In addition it must be consistent, as far as practicable, with existing emergency arrangements for the transport of radioactive materials within the UK. The specification therefore included information on the consultations which were considered to be an important factor in determining the appropriate arrangements.

COMPARISON OF EXISTING EMERGENCY PLANS WITH THE SPECIFICATION

The two principal plans applicable to road and rail transport in the UK are:

(i) The Irradiated Fuel Transport Flask Emergency Plan (IFTFEP)

(ii) The UK Nuclear Industry Road Emergency Response Plan (NIREP 1990)

The aim of IFTFEP is to achieve a rapid and effective response to any mishap involving an irradiated nuclear fuel transport flask in transit by rail or by road to a railhead. The plan for transport in England and Wales is maintained by Nuclear Electric plc and the equivalent plan in Scotland is maintained by Scottish Nuclear Ltd. The main objective is to provide a health physicist at the scene of the incident as soon as possible, followed by a flask emergency team carrying specialised equipment.

NIREP was developed out of a need to establish emergency arrangements for road transport of radioactive materials, which would form a suitable Contingency Plan as required by the IRRs. The plan became fully operational in 1990 and was developed by the nuclear industry in full consultation with all relevant organisations, including the regulators and emergency services. The aim of the plan is to achieve a rapid and effective response to any incident involving a radioactive package being transported by road. It specifically excludes transport of irradiated fuel flasks to/from a railhead, the transport of nuclear weapons or the transport of excepted packages. NIREP draws upon resources available within the nuclear industry, together with health physics support from participating organisations. Although currently the plan only covers road transport, agreement in principle has been reached with British Rail to extend the plan to cover rail transport.

There is also the National Arrangements for Incidents Involving Radioactivity (NAIR 1987), which is a voluntary scheme (in that there is no statutory obligation on the organisations responding under the scheme) for the provision of specialist advice and assistance to the police in the event of an incident involving radioactive material. There are two stages of response. In stage 1, assistance is given by a suitably qualified person locally who can advise the police on the nature of the radiological hazard and, if necessary, advice on any appropriate action to minimise the hazard until the arrival of more expert assistance. Often, stage 1 contacts are the radiophysics departments of hospitals. In stage 2, assistance is given by a major nuclear establishment capable of deploying more elaborate resources. Stage 2 cover is provided largely by the nuclear industry. NAIR provides a useful back-up to NIREP and IFTFEP, and may be invoked by the police at their discretion.

A number of possible options were identified as potential Emergency Plans for road, rail and road/rail transport of radioactive waste:

(i) Extension of IFTFEP to cover road and rail transport of radioactive waste

(ii) Extension of NIREP to cover transport of radioactive waste by rail

(iii) Extension of IFTFEP to cover the rail transport of radioactive waste, and the use of NIREP for the road transport

(iv) Introduction of separate arrangements for the transport of radioactive waste by rail, using NIREP for the road part of any journey

(v) Introduction of separate arrangements for the transport of radioactive waste for both road and rail to give an integrated system separate from other plans.

It was considered that any of the above options would meet the legal requirements for an Emergency Plan and be consistent with the Planning Basis derived from the proposed transport arrangements. However, it is considered that the introduction of any additional Emergency Plans could lead to confusion, and any attempt to introduce a separate Emergency Plan for transport of radioactive waste would be unwelcome to the organisations likely to be involved, notably the Emergency Services. Therefore options (iv) and (v) did not appear to represent viable solutions.

This view was endorsed by the UK waste producers, most of whom are already involved in using one or more of the existing Emergency Plans.

Option (iii) would lead to the operational complication of consignors of waste to the repository having two separate emergency plans for the transport of waste to the repository.

Adopting option (i) would mean the use of emergency arrangements different from those relating to other radioactive material transported by road, apart from the road transport of fuel flasks from power stations to railheads. Similarly, adopting option (ii) would lead to two distinct plans for rail transport.

Clearly, there are some disadvantages associated with options (i), (ii) and (iii). Nevertheless, on balance, it was considered preferable to have a single emergency plan for The transport of waste to the repository, which would be an extension of either NIREP or IFTFEP, ie options (i) or (ii).

A detailed comparison of the contents of each plan with the requirements of the Specification was performed. The comparison identified aspects of current versions of each plan which did not fully meet the specified requirements of Nirex though none appeared to represent an insurmountable problem. After further careful consideration it was concluded that, on balance, the best option was to adopt NIREP, particularly since discussions with British Rail for the extension of NIREP to cover rail transport of radioactive packages (other than irradiated fuel transport flasks) were well advanced. Although this would mean two plans for rail transport of radioactive materials, NIREP and IFTFEP, it was considered that any potential difficulties could be quickly rectified by the provision of suitable training and exercises to test the proposed arrangements.

JUSTIFICATION FOR CHOICE OF NIREP

NIREP meets the key requirements of an Emergency Plan identified in the planning basis:

(i) NIREP has a simple effective notification procedure and there is a communications centre manned continuously 24 hours per day, the UKAEA Constabulary Force Communications Centre (FCC) at Risley.

(ii) NIREP has a large number of responding sites, well distributed throughout the UK and favourably located with respect to the identified stretches of road/rail where accidents could occur relatively more frequently. Therefore it can be assumed that, in general, expert advice could be mobilised and at the scene of any incident within 2 hours of notification. There is, moreover, an arrangement with the Ministry of Defence to provide helicopter assistance for attending incidents in remote locations where conventional transportation would be impracticable, or take too long.

(iii) The emergency instructions provided for the road vehicle driver or train crew include an instruction to establish an exclusion zone around any apparently damaged package. The instructions for the Civil Police, who would normally take charge at the scene of the incident, include a similar statement.

The current version of NIREP essentially meets the requirements of the Emergency Plan Specification; the NIREP Working Group has endorsed the concept of using NIREP for the transport of waste to the repository and also decided to incorporate appropriate amendments when the Plan is next revised. The amendments are related to the following topics:

(i) Communications. A reference to the Log Book used by members of the FCC to record all communications will be included.

(ii) Public Information. The position regarding responsibilities for the issue of press statements will be clarified.

(iii) Exercises. A brief description of the testing arrangements will be included.

(iv) Updating. A statement concerning the periodicity of updating and the person responsible will be provided.

CONCLUSIONS

This paper has summarised the results of the studies and discussions which have led to the recommendation that Nirex should adopt NIREP as the Emergency Plan for the proposed transport arrangements of radioactive waste to the proposed UK deep repository for the disposal of low level and intermediate level waste. Although NIREP is currently specific to the road transport of radioactive materials, it is in the process of being extended to cover their transport by rail. An extended version of NIREP, covering both road and rail transport, could be operational by the end of 1992.

NIREP is an established plan which meets all the current legal requirements and is flexible enough to accommodate any likely changes in legislation in the future. It is compatible with the Planning Basis and meets the requirements of the Emergency Plan Specification.

The extended version of NIREP will be subject to an annual full-scale exercise and the Plan should be well-proven by the time that transport of waste packages to the repository commences.

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