



Nuclear Emergency Arrangements Group (NEAG)

NEAG Paper No 2

**Radiation (Emergency Preparedness And Public Information)
Regulations 2001**

Naval Nuclear Propulsion Programme

Update Of Information Provided To Local Authorities

DES/SM/SW/0405/427/19

29 Jul 09



MINISTRY OF DEFENCE

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Introduction

1. Revised assessments of potential accidents and their associated consequences have been carried out by MOD in accordance with statutory (REPPiR) requirements. These assessments have led to the identification of a Reference Accident, defined as the worst case accident which although unlikely is realistically possible. REPPiR identifies that the consequences of a Reference Accident defined in this way constitute an appropriate basis for the design of detailed emergency response plans for the protection of both the workforce and the public who may be affected by an accident. Further, plans drawn up in this way then provide a suitable basis for dealing with an even less likely but potentially more severe accident through the concept of extendibility.

Regulatory determination

2. Following these revised assessments, HSE/NII have determined that an off-site emergency plan is required and that this should be designed to secure the protection of people within an area extending to a distance of not less than 1.5 km from a submarine berth. This is a change from the previous determination which identified a zone extending for not less than 2 km from a berth.

Provision of information to Local Authorities

3. On the basis of this revised determination, the operator (MOD) is required to provide relevant information to Local Authorities to enable them to review and revise their off-site emergency response plans. This information and associated advice is set out in this paper.

Emergency response - planning zones

4. The 1.5 km zone identified by HSE has been determined in accordance with protocols set out in REPPiR based on the potential exceedance of defined radiation doses over the year following the accident. In contrast, the detailed design of emergency response plans, specifically the optimisation of a countermeasure strategy for the protection of the public, needs to take account of the hazards arising over much shorter periods of time, indeed initially over the first few hours. These hazards follow from the characteristics of the Reference Accident (described below), and need to be compared with Emergency Reference Levels (ERLs) of dose specified by the National Radiological Protection Board (now the Health Protection Agency – Radiological Protection Division) as key decision-making aids in planning for the protection of the public.

Reference Accident – characteristics

5. The characteristics of the Reference Accident are as follows:

- A number of cautious assumptions are made about the radioactive material inventory and other characteristics of the reactor.
- A leak occurs in the primary cooling circuit of the reactor which cannot be isolated and which is beyond the capacity of coolant make-up systems.
- A series of extremely unlikely engineering and other failures also occur.
- The primary coolant leak coupled with the engineering and other failures lead to damage to the fuel within the reactor after >3 hours, resulting in elevated gamma radiation levels around the reactor.
- The fuel damage in turn releases some radioactive material from the reactor. This is largely contained within the submarine but a small proportion may be released to the environment over the following 1-2 days.

- The radioactive material would be carried downwind and would therefore present a hazard in the downwind sector only. This hazard would arise principally via inhalation initially.

Nuclear reactor accident and related definitions

6. Further to the definition of the Reference Accident and its characteristics as described above, and in common with the approach now adopted across the nuclear industry under the co-ordination of the multi-agency Nuclear Emergency Planning Liaison Group, definitions and associated guidance concerning MOD nuclear reactor accidents are being amended as follows:

- **Fuel Integrity Alert** – an event which is likely to lead to fuel damage within a nuclear reactor.
- **Off-Site Nuclear Emergency** - a hazardous condition on site which may require the implementation of urgent countermeasures to protect the public.

Notes:

1. A Fuel Integrity Alert would be declared by the submarine and would have the effect of closing-up specialist technical support ashore in order to assist. NB A Fuel Integrity Alert does not constitute a nuclear accident.
2. An Off-Site Nuclear Emergency would be declared by the specialist technical support ashore on the basis of an assessment that fuel damage sufficient to cause a radiation hazard was likely.
3. In common with the approach adopted across the industry, the operator (MOD) will provide immediate notification to the civil authorities in the event of an Off-Site Nuclear Emergency.
4. It is envisaged that (as currently) declaration of an Off-Site Nuclear Emergency would be made on a precautionary basis in advance of a hazard (or fuel damage) actually occurring, based on specialist technical assessment.

Reference Accident – hazards

7. The conclusions of a detailed assessment of the hazards arising in the event of the Reference Accident in comparison with ERLs of dose are as follows:

- Fuel damage arising from the Reference Accident would give rise to significant direct gamma radiation doses in the immediate vicinity of the submarine such that early evacuation would be warranted to a distance of 200 m. NB No members of the public would be expected to be within this area.
- Gamma radiation doses would be substantially attenuated beyond this distance but the lower ERL for shelter would be exceeded at a relatively early stage to a distance of 400 m. This hazard area extends in all directions.
- A release of radioactive material arising from the Reference Accident would lead to the lower ERL for PITs being exceeded to some 1.2 km downwind within the first few hours. Exceedance of the shelter ERL would be over a more limited area.

MOD advice on the protection of the public

8. The revised assessments described above, in particular the Reference Accident as defined, its characteristics, timescale and consequences, together with the revised HSE determination provide a sound basis for reviewing the optimum arrangements for the protection of the public. The following generic advice on the form of these optimised arrangements is provided on the basis of MOD's review of this information.

Defence Equipment & Support

- In accordance with the HSE determination, the off-site emergency plan is required to secure the protection of the public within an area extending to a distance of not less than 1.5 km from a submarine berth.
- Declaration of an Off-Site Nuclear Emergency by the operator to the civil authorities should provide the trigger for implementing the off-site emergency plan and for initiating actions to protect the public.
- MOD advise that this declaration should trigger the following precautionary actions to protect the public in the early stages:
 - Controlled evacuation of the immediate area around the berth (nominally 200 m). NB No members of the public would be expected to be within this area.
 - Advice to members of the public within 400 m (all directions) to shelter indoors in order to protect against direct gamma radiation hazards from the submarine.
 - Provision and consumption of PITs by members of the public within 1.2 km downwind in order to protect against an uptake of radioactive iodine to the thyroid.
 - Advice to members of the public in the 1.2 km downwind PITs zone to shelter indoors in order to protect against a release of radioactive material.
 - MOD advise that any further protective action would not be justified on a precautionary basis but in the event of an accident should be considered by the civil authorities on the basis of specialist technical assessment of the development of the accident coupled with radiation monitoring measurements. MOD operators will provide this information and advice from an early stage.

Way ahead

9. MOD operators undertake to work locally with civil authorities in order to customise this generic advice to local circumstances.

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