

The NII Approach to Regulation of Direct Radiation from Nuclear Licensed Sites
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Introduction

1. Members of the public can be exposed to ionising radiations from nuclear licensed sites from different mechanisms. Firstly liquid or gaseous discharges of radioactive material from the site. This can give rise to doses by inhalation, direct radiation from material deposited on the ground or via the food chain. Secondly people can be exposed to direct radiation from the operations taking place on the site.
2. The relevant Environment Agencies regulate the disposal of radioactive material, which includes discharges through the provisions of the Radioactive Substances Act 1993(1). The regulation of exposure to direct radiation from the operations on the site is the responsibility of the Health and Safety Executive. This is delegated to the HSE's Nuclear Installations Inspectorate (NII) for the nuclear licensed sites and other sites for which NII is the regulating body. The regulation of exposure to direct radiation is undertaken using the provisions of the Nuclear Site Licence and appropriate regulations, eg the Ionising Radiations Regulations 1999 (IRR99) (2).
3. The responsibility for safety of the public lies with the employer, which on the nuclear licensed sites is the licensee. Historically the NII has regulated the exposure to direct radiation by inspecting and ensuring that the licensees had adequate arrangements for monitoring exposure to direct radiation around the site and estimating the resulting doses arising from that exposure, and by assessing the results of the licensees monitoring and calculations. This was largely undertaken by the site inspectors with support from radiation protection specialists as appropriate.
4. In 1993 NII, with the support of its senior management group, decided to supplement this approach with a programme of independent measurements carried out by ourselves or contractors on our behalf. In general the contractors were used for making measurements of neutron doses and conducting habits surveys around sites to identify critical groups, areas in which the NII did not have the relevant expertise. NII has reported previously on progress with this programme (3,4,5).
5. A programme for the measurement of the licensed sites was drawn up and a protocol(6) for the measurements developed. The gamma dose rates at the sites were measured using Mini Instruments Type 680 environmental doserate meters. In general arrangements were made to take measurements in the conditions when the dose rates were highest, for example at a power reactor site when all reactors were operating. Suitable subtractions were made to allow for the instrument noise and cosmic ray background to derive an air kerma rate. The air kerma rate was then adjusted to allow for terrestrial background using a combination of published data and our own measurements. These measurements were made at a location in the vicinity of the site being assessed of similar geology but remote from the influence of the site. The results of the air kerma measurements were then converted into a dose. These results were combined with the results of the neutron measurements and habits surveys as appropriate to derive a dose to members of the critical group.

DOSE CRITERIA

6. The statutory dose limit to a member of the public is specified in the IRR99 as 1mSv. These regulations implement the provisions of the EC BSS Directive 96/29 EURATOM(7) reflecting the recommendations of the ICRP in its publication 60(8). The NII's Safety Assessment Principles for nuclear plants (SAPs)(9) sets a Basic Safety Limit (BSL) of 1mSv and a Basic Safety Objective of 0.02mSv per year for members of the public. NII expects the licensee to demonstrate that the doses are below the BSL and that doses above the BSO are demonstrated to be ALARP. This is in line with the principles of limitation and optimisation of the ICRP. It should be borne in mind that the dose limit specified in the regulations is for exposure via all pathways and not just direct radiation. Prior to 1/1/00 the public dose limit was 5 mSv per year.

Historical Developments

7. The original intention was to complete the programme of measurements within 5 years for all the then licensed sites. However, resource limitation, changing priorities and the increase in the number of nuclear licensed sites and other sites regulated by NII has resulted in the original programme targets not being met. It should be noted that the intent of the NII programme is to check the adequacy of the licensees arrangements and not to make definitive measurements of the doses to the critical group. It is at best a 'spot check' measurement. The results of the licensees measurements integrated over the relevant calendar year are the data that are best able to assess exposure of the public. As well as taking measurements the inspection will focus on the licensees' arrangements and assessment of the data that they generate.

Results

8. To date the NII has established its own measurements at some 25 sites. In all cases the exposure of the critical group to direct radiation is <1mSv. At certain sites the examination of the licensees data coupled with the NII measurements has resulted in actions being taken to reduce the exposure of the critical group within the ALARP region.
9. At Dungeness the doses resulting to the critical group were established as being in the region of 0.9mSv per year. As a result of discussions with the licensee additional shielding was placed on one of the reactor buildings. Further measurements indicated that this has reduced the dose to the critical group to about 0.6mSv per year.
10. At Amersham, Bucks there is an occupied cottage close to part of the perimeter fence. At the time the NII was making its measurements a waste store was located adjacent to this part of the fence together with the dispatch area for the radiochemicals. As a result of the NII assessment the licensee agreed to move the location of the waste store away from the perimeter fence to a position well within the site and made improvements

to the shielding at this part of the perimeter wall. This resulted in a reduction of the assessed dose to the critical group.

Recent Developments

11. The NII has recently introduced a system of requesting the annual returns of data from the licensees measurements. This will allow assessment of these data and decisions to be made on whether further inspection of the licensees arrangements needs to be made. This will enable targeting the required inspections and suitable prioritisation of resources.
12. Additionally the Environment Agency responding to a direction from DEFRA, has developed a methodology to assess the population doses from multiple sources and exposure pathways of radioactivity. The NII was involved in the steering group for this project. The NII, FSA and EA have also started a programme with CEFAS to gather information on the habits of individuals around licensed sites to establish those that may have behaviour resulting in exposure from different pathways.

Summary

13. The HSE through the NII is the regulator for ensuring that licensees and other sites ensure that exposure to members of the public to direct radiation from the operations on the site are kept below the dose limit and are ALARP.
14. Licensees employ a variety of techniques in ensuring that the doses received by members of the public are low and a variety of methods in demonstrating this to be the case.
15. The NII independent assessment has in some cases prompted the licensee to review their arrangements and make changes to ensure doses are ALARP.
16. In all cases where the NII has made independent measurements the doses received by members of the public living close to the site is significantly less than the 1mSv dose limit.
17. The NII is working with the Environment Agency and Food Standards Agency on projects to study the effects of exposure of members of the public to exposure from all pathways.

References

1. The Radioactive Substances Act 1993.
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4. CE Temple, A regulatory programme to assess licensees' arrangements for monitoring the public impact of direct radiation from civil nuclear sites in the UK, IRPA, Vienna 1996.
5. D N Simister and P M S Stephen, A regulatory programme to assess licensees' arrangements for monitoring the public impact of direct radiation from civil nuclear sites in the UK – an update, 6th SRP International Symposium, Southport 1999.

6. Independent Off-site Monitoring of Direct Gamma and Neutron Doserates and identification of critical groups, HMNII unit 2C guidance note No. E2
7. Council Directive 96/29/EURATOM, OJEC No L 159/1.
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9. Safety Assessment Principles for Nuclear Plants, HSE 1992, ISBN 0 11 882043 1.