

DELICENSING OF NUCLEAR SITES IN THE UK

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INTRODUCTION

In the UK, the operation of nuclear facilities is regulated under the Nuclear Installations Act 1965. This Act requires the issue of a licence for a number of prescribed activities. Once a licence is issued the licensee's period of responsibility continues until the Health and Safety Executive (HSE) gives notice in writing that there has ceased to be any danger from ionising radiations. This requirement applies whether the licensee wants to remove part or all of the site from his responsibility. Both of these processes are often referred to as delicensing. As with any other licensing function under the NIA65, the Nuclear Installations Inspectorate (NII) carries out this process on behalf of HSE.

Since the inception of the original Act in 1959 there have been a number of occasions where licensees have sought to end their period of responsibility or exclude parts of the site. As current facilities age and enter the decommissioning phase of their operations it is likely that there will be an increase in the number of requests NII receive to end the period of responsibility. It is therefore important that the process under which delicensing takes place is understood and that there is a suitable mechanism on which a judgement can be made regarding the suitability for the period of responsibility to be ended. This paper sets out some views on this process from a regulatory standpoint and discusses some practical aspects of how suitability may be demonstrated.

REGULATORY PROCESS

In the UK the licensee is responsible for safety until the period of responsibility ends. In seeking to end the period of responsibility similar procedures to those undertaken for an operational plant are expected. The work will have to be planned and managed safely and the regulator would expect that appropriate safety cases for the various stages leading to this end point are prepared. Before delicensing can proceed a safety case would need to be submitted for NII's consideration. Such a case will need to address a number of aspects, which could typically include:

- History and use of the land

- Type of work undertaken

- Arrangements for preserving records, appropriate to the licensee's obligation under the licence, i.e. records relating to site operations which may be used as evidence in any claim resulting from such operations.

- The state and maintenance of the plant in the shutdown condition.

- The necessity for any dismantling of the plant or buildings and for any subsequent cleaning-up operations.

- The management and disposal of radioactive waste.

- Reason for excluding from a nuclear site licence.

- Evidence that no leakage of radioactive matter has occurred into the land, or if such has occurred how it was dealt with.

- Evidence that no radioactive contamination has been deliberately sealed or fixed into structures that will remain after the site is declared free from danger.

- Information concerning natural background radiation in the vicinity.

- Site survey information that compares measured levels with local background.

NII will be looking to establish that, to the degree necessary for the purposes of the Act, remaining levels of radioactivity are indistinguishable from those which would naturally occur in the area.

TECHNICAL EVALUATION

The previous discussion sets out the type of information that NII would expect the licensee to provide for its consideration. It is clear that there are a number of aspects against which such a safety case can be assessed and there will be site specific features. There will therefore be a mixture of qualitative and quantitative judgements depending on the site. An important aspect is to be able to interpret the monitoring undertaken and to form a judgement on whether it is appropriate for the circumstances and whether further monitoring is reasonably practicable. Monitoring approaches may include direct radiation monitoring and soil sample analysis. To help NII's judgement some technical investigation of the available techniques for the former and the detection capabilities has been undertaken in conjunction with NRPB. All currently available instrumentation has an inherent instrument background. This limits the level of radioactivity which can be measured with any degree of certainty and sets a detection threshold. In addition, there is a limit to the discrimination between a response due to natural background and any contaminant found. These are generic aspects which will apply to all delicensing cases. There is a very real practical need to establish whether it is possible, with current instrumentation, to easily monitor low levels of environmental radioactivity and to know the limitations of the measurements.

RESULTS

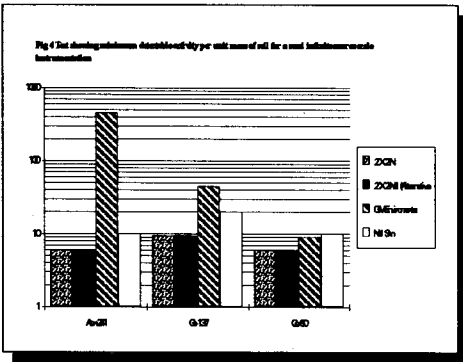
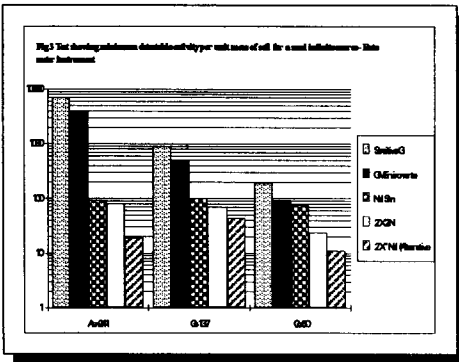
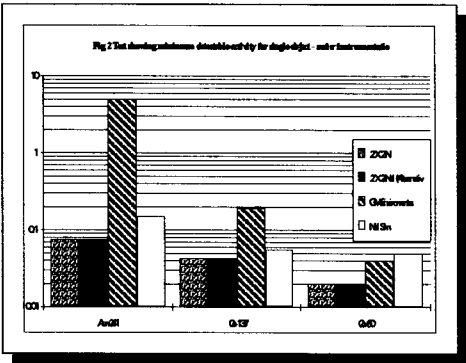
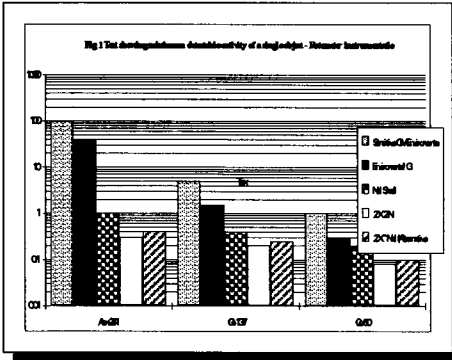
A range of possible monitoring instrumentation is available in the UK. Some commonly available instruments currently in use for directly monitoring levels of radiation were selected with the view to performing the following tasks;

Determine the minimum detectable activity assuming a single object in the ground.

Using instrument in a scaler mode with a 30 second counting time assess the minimum detectable activity.

Relate each minimum detectable activity to a concentration in soil.

For each task a range of single nuclides was assumed (Co-60, Cs-137 and Am -241)



The results show that in general a lower level of detection can be achieved with instrumentation in a scaler mode. Figures 1&2 indicate that some instrumentation has the capability to measure levels at 10 MBq in ratemeter mode and 1 MBq in scaler mode for a number of nuclides. These results illustrate the level of activity, in a single object, above which there is a high degree of confidence that the measurement is due to presence of radioactive material. (Full details of the arrangement and tests are provided in ref 1.) It should be pointed out that this is an implied level of activity and could be due to natural radioactivity or the presence of artificial radionuclides. To clarify this would require further determination, probably using gamma spectroscopy equipment to compare with the natural background spectrum. The initial monitoring is a first step and provides valuable information to enable regulatory decisions about the need for and type of more detailed monitoring programmes.

Turning to figures 3 and 4, they provide information which relates to what the instrumentation response means in terms of a minimum detectable activity in the ground. This is useful in terms of comparison with criteria under other UK legislation and again for comparison with natural background levels for the area. The results illustrate that it appears to be possible to monitor for levels of 1 Bq per gram for a range of nuclides. The investigations have shown that it is possible to carry out such measurements in reasonable timescales using standard equipment.

Some scoping work was done to extend this technical evaluation to examine the effects of shielding due to normal building materials and depth of buried objects. The difficulties of measuring for Plutonium was also investigated as was the use of portable gamma spectrometry equipment as part of the overall task. The latter aspect can be important due to the variation in the natural radioactivity content in building material. The basic conclusion of this scoping work was that for artificial isotopes it is reasonable practicable to achieve low limits of detection.

CONCLUSIONS

The process by which a site can be delicensed requires a range of information to be provided to the regulator. The experimental work undertaken has shown that it appears to be technically possible to monitor low levels of radioactive material using portable instrumentation which can subsequently be compared with current regulatory levels for below regulatory concern and natural background. The paper has also illustrated that judgements on delicensing need to be made in empirical and quantitative terms.

The views expressed in this paper are those of the authors and do not necessarily represent those of their respective organisations.

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Measurable levels of Ground Gamma Emitting Contamination, A report for the Nuclear installations Inspectorate, PH Burgess National Radiological Protection Board. May 1995