

Reclassification of Security at a Nuclear Waste Disposal Repository

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1. Introduction

The National Nuclear Waste Disposal Repository in the UK, a nuclear licenced site which has been in operation since 1959, has recently been able to reclassify its security status. This has been made possible by the removal of the bulk inventory of Plutonium Contaminated Material (PCM) from temporary storage, and the transport of this material to a suitable Intermediate Level Waste store at the nearby, but separate, Sellafield nuclear licenced site.

This paper describes the necessary steps involved in reclassification of the Repository site to a lower security category, involving UK regulators, in particular the Office of Civil Nuclear Security. It also discusses the issues associated with reclassification, such as public acceptability and reassurance, policing, data quality, and other issues unique to the site.

With regard to ALARA, an essential element in the reclassification was the confidence that assurances could be given to the nuclear and environmental regulators that doses to the workforce and the general public will remain as low as reasonably achievable.

2. The Radiation Risks from Low Level Waste in the UK

The UK has 24 Magnox (uranium metal fueled, graphite moderated, gas cooled) reactors at 10 sites, all scheduled to be shut by 2011, 14 AGR (Advanced Gas-cooled reactors - uranium oxide fueled, graphite moderated) at 6 sites and one Pressurised Water Reactor. It has two reprocessing plants at Sellafield and a fully functioning weapons industry. In addition, nuclear materials used at hospitals, research and medical facilities constitute the remaining parts of the nuclear industry. As a result of the above activities, nuclear waste is generated, the vast majority of which is classified as solid Low Level Waste (material containing contaminants below 12 GBq/te beta, and below 4 GBq/te alpha). The destination for this waste is ultimate disposal at the UK Low Level Waste Repository (LLWR) situated in Cumbria, near the Sellafield site.

The radiation dose levels in the vicinity of the LLWR are dominated by the nearby Sellafield site. The highest public dose from Sellafield, is 0.22 mSv or 220 microsieverts; however over 99% of the public receive less than 1 microsievert from activities at Sellafield. Maximum public dose levels from the LLWR discharges itself are much less than 1% than those from Sellafield, and are too low to measure due to the background,

but have been modelled at around 0.00001 mSv or 0.01 microsievert. Direct radiation from the LLWR site is below 40 microsieverts to a theoretical most exposed household. In collective dose terms, the total annual public dose committed by the entire UK nuclear industry is 6.3 man sieverts, implying (at the current ICRP recommendation of 6% of a statistical fatality per man sievert) of some 0.4 fatalities at some time in the future.

3. The Low Level Waste Repository (LLWR)

The LLWR is a low-level solid radioactive waste disposal facility covering some 100 hectares, located around 6 km south-east of Sellafield, near to the village of Drigg, in Cumbria. Initially, the site was operated by the UK Atomic Energy Authority, and transferred to British Nuclear Fuels Limited in 1971. In 2007 the Nuclear Site Licence holder and operator became LLW Repository Ltd.

The LLWR is certificated under both the international Environmental Management standard ISO14001 (2004), the Quality Management standard ISO9001 (2008) and the Health and Safety standard BS OHSAS 18001 (2007). In the early years of waste disposal at the LLWR, wastes were 'landfilled' according to conventional practice (i.e. tipped into open trenches before being covered with a layer of earth). The trenches benefited from clay lining, both natural and enhanced. The last trench was filled in 1995. All trenches have now been covered with an impermeable membrane and landscaped. A final site cap will be installed as part of the eventual site closure.

Since 1995, waste materials are, wherever possible, compacted and placed in containers before transfer to the LLWR; for the majority of wastes, this is done at Sellafield. Non-compactable wastes are placed directly into the disposal containers, and immobilised by the addition of grout in the LLWR Grouting Facility. All wastes, in their containers, are placed in an engineered concrete vault. A new vault is currently under construction and will provide 100,000 m³ extra capacity, although with the construction of additional vaults it will be capable of being extended to give additional capacity until 2050. Final site closure is expected to be in 2059, and will include the decommissioning of remaining facilities and the installation of an engineered cap and other measures to ensure the long term isolation of the site.

With regard to solid wastes arriving on the site for disposal at the LLWR, all waste is dispatched in accordance with the consignors' own disposal authorisations issued to them by the Environment Agency and the Scottish Environment Protection Agency. In addition, all waste disposals must comply with LLW Repository Ltd's Conditions for Acceptance. These include requirements that ensure compliance with the authorisation applicable to the LLWR site itself and a requirement that consignors have their own appropriate quality assurance arrangements in place. Quantitative limits are set on the levels of total radioactivity, and of specific radionuclides, disposed of to the LLWR.

The monitoring, retrieval and transfer to Sellafield of a quantity of Plutonium Contaminated waste Materials (PCM), both drums and larger items, which had been stored at the LLWR awaiting conditioning and treatment, was completed in July 2007. The PCM is now being stored at Sellafield prior to final disposal. The decommissioning of the old PCM storage facilities has now commenced and is due for completion in 2010. It is the existence of PCM on the LLWR site that has, until 2007, demanded a site security status of Category III, by the UK Office of Civil Nuclear Security (OCNS), the security regulator.

4. Environmental Releases of Radioactive Materials from LLWR

The principal source of liquid effluent is leachate from the trenches predominantly from earlier, less contained, waste disposal practices. These arise from rainwater ingress and groundwater movement, and could potentially migrate from the waste burial site. The leachate is collected in holding tanks for monitoring prior to discharge to sea via a pipeline, subject to the site authorisation which places regulatory controls on such discharges.

Effluent minimisation has been actively managed through capping of trenches to reduce rainfall infiltration. Radioactivity concentration in leachate is minimised through isolation of the waste from rainwater and groundwater infiltration by emplacement in containers within the engineered vault.

Low level waste disposals and PCM transfer operations undertaken at the LLWR have not given rise to any significant aerial discharges of radioactivity, as confirmed by monitoring of discharges on stacks associated with the LLWR Grouting Facility and the PCM Retrieval Facility. High Efficiency Particulate Air (HEPA) filtration for authorised aerial discharge points is in place.

The discharges of aerial and liquid effluents are considered so low as to not warrant quantified limits, however, the authorisation requires the LLWR to apply the 'Best Practicable Means' to minimise waste generated on the site and to ensure that the radiological impacts of wastes disposed of to the site will be As Low As Reasonably Achievable.

5. Security Arrangements at LLWR until July 2007

Security categories for UK Nuclear sites range from I to IV, with I being the highest category. This categorization is determined by the Office of Civil Nuclear Security (OCNS) depending on particular radioactive material inventory characteristics. From the time when radioactive materials were first stored on the Low Level Waste Repository, the site was categorized as a Category III site and the security of the site was the responsibility of the United Kingdom Atomic Energy Authority, who employed the UKAEA police force as an integral part of the Site Security Plan, to guard the site. Later the ownership of the site and the Nuclear Site Licence transferred to British Nuclear

Fuels, but the security category remained at category III and guarding was carried out by the Civil Nuclear Constabulary, an armed force.

The primary reason for the Categorisation as III was due to the inventory of PCM, strictly speaking an Intermediate Level Waste, stored at the site pending transfer to Sellafield for storage. This transfer of all the bulk PCM packages and drummed waste was completed by July 2007, however, minor contamination of the storage areas remained.

In order for the site to be re-classified, the first step was for the Nuclear Site Licence holder to provide assurances to the Nuclear Installations Inspectorate and OCNS that all the bulk PCM had indeed been transferred to Sellafield, and that the remaining contamination inventory was below the maximum quantity for Category IV. The Security Category IV threshold for plutonium contaminated waste in the UK is defined by the Nuclear Industry Security Regulations 2003 – Technical Requirements Document. The limits are stated by weight of nuclear material (plutonium and uranium), the form of the waste and its containment. Further requirements apply to the quantity and nature of radioactive sources on the site.

This required physical examination of the storage areas, followed by radiological measurement and assessment monitoring. The monitoring reports were assessed and approved by the LLWR Management Safety Committee prior to the request for reclassification. Following verification of the nuclear material inventory LLW Repository Ltd was required to submit a Site Security Plan to the NII and OCNS. This Site Security Plan reflects the Security Category and the perceived risk for security of the nuclear material. It places requirements for physical security, information security and personnel security.

The final key step in reclassification of security category was to agree a change in the Nuclear Site Licence to enable a private security guard force to secure the site rather than the Civil Nuclear Constabulary.

It should be noted that not only the Site Operators and Nuclear Regulators have a stake in the security of the site. The public, in particular the local public, also need to be reassured that the site is safe, and poses the minimum threat to residents from the effects of theft or terrorist activity. Until July 2007 the continuous presence on the site of an armed Police force provided this.

6. Stakeholder Engagement

Initial discussions with stakeholders, particularly those local to the site, revealed strong opposition to the idea of moving away from a police force. Adverse press coverage by the local media was initially observed. To address this public opinion a specific sub group of the sites stakeholder liaison group was established.

The members of this group were relevant representatives from the local community, the relevant local and county government sections, the relevant government agencies, the CNC, the proposed guard force and LLWR.

The main concern held by the local communities was that the reduction in security was being driven by a desire to reduce costs and that the security of the site would be adversely affected. The sub group met several times prior to the transfer and the concerns of the stakeholders were discussed openly and in detail. The site personnel ensured that the reduction in inventory and hence security risk was well understood by the group. The involvement of CNC in this group allowed the stakeholders to understand that the CNC police were a finite resource focused on counter terrorism of high security sites. The site was very open about the cost savings associated with the change but made it clear that this was not the main driver for the change.

The main concerns held by the stakeholder group were that the 'powers to arrest' potential law breakers held by CNC would be lost and the security of the local communities would be reduced. It was explained that the vigilance of the guard force would not reduce and ongoing support from CNC would ensure an appropriate response to any suspicious occurrence observed on or around the LLWR site

The remaining concerns surrounded jobs for local people, this was addressed by the new guard force who were committed to providing a significant proportion of the positions to local people.

Early stakeholder engagement proved very successful with the sub group reporting back to the main stakeholder liaison group that they were comfortable with the proposed changes in security for the LLW Repository site. At the present time, after more than one year of using the contract Guard Force, stakeholders appear to be satisfied with their performance

7. Security Arrangements at LLWR from July 2007

The downgrading of the security categorisation from Category III to Category IV, once approved by the various organisations described above, had considerable advantages both for the site Operator, the Regulators, and the Civil Nuclear Constabulary.

The primary change was the recruitment of a privately owned security guard force in the place of the Civil Nuclear Constabulary. This new guard force had to meet the requirements of the Security Industry Authority (SIA) The SIA is the organisation responsible for regulating the private security industry in the UK. It reports to the UK Government Home Secretary. Training in both conventional and nuclear safety, as well as a detailed understanding of the security issues within the site, was required. The LLWR Security Manager, an employee of the Site Licence Company, issues working instructions to the Guard Force and controls their security duties.

The double benefit of the significantly reduced cost of using the private guard force, as well as releasing the scarce resources of the Civil Nuclear Constabulary to police nuclear sites of higher security classification, is appreciated by the site Owner and OCNS. In addition, reduced regulatory costs from the NII and Environment Agency should, in time, be evident, releasing their resources into more relevant roles.

8. Future Reassurance of Security Arrangements at LLWR

The Owners, Operators, Regulators and the Public require reassurance that security measures to prevent unauthorized access to the site and to nuclear materials, is maintained at acceptable levels. This is achieved by:

- Close management of the private guard force by LLW Repository Ltd
- Regular reviews of the duties and performance of the Guard Force
- Inspections by the Regulator, OCNS
- Undertaking of witnessed emergency exercises.

9. Conclusions and Recommendations

It is concluded that despite the significant amount of work involved in the reclassification of security at the LLWR, the long term benefits to all concerned will outweigh any perceived or actual detriments, and it is recommended that other European nuclear facilities in a similar position review their security arrangements.