W4.3 UK approach to optimisation and *in-situ* disposal of radioactive waste on nuclear sites

WASSC-48
29 October 2019
Simon Morgan, Principal Inspector of Nuclear Safety
UK context
Power-producing nuclear reactors

- Advanced Gas-cooled Reactors (AGRs, 7 sites, 14 reactors)
- Pressurised Water Reactor (PWR, 1 site, 1 reactor)

Images copyright EDF Energy
Defence facilities

- Propulsion (5 sites), weapons (2 sites), naval bases

Image copyright BAE Systems
Research installations

• Dounreay, Harwell & Winfrith (3 sites)
Uranium enrichment

- Urenco, Capenhurst (1 site)
Nuclear fuel manufacture

- Springfields, Preston (1 site)
Magnox reactors

- 10 sites (decommissioning)
Research reactor

- Imperial College, Ascot (1 site, decommissioning)
Pharmaceutical manufacture

• GE Healthcare, Amersham & Cardiff (2 sites)
Reprocessing & waste management

- Sellafield (1 site)
Metal recycling

- Cyclife, Lillyhall (1 site)
Low-level waste disposal

- LLWR, Drigg (1 site)
UK Parliament

UK Government

Office for Nuclear Regulation (ONR)

Environment Agency

Scottish Government

Welsh Government

Scottish Environment Protection Agency (SEPA)

Natural Resources Wales (NRW)

Nuclear Decommissioning Authority (NDA)

37 Licensed sites / operators
(17 of which operate under contract or are subsidiary to NDA)
**Nuclear licensed sites**
- Nuclear safety
- Conventional health & safety
- Radiological protection
- Nuclear security
- Nuclear safeguards

![Office for Nuclear Regulation](image)

- Nuclear Installations Act 1965
- Health and Safety at Work etc. Act 1974
- Nuclear Industries Security Regulations 2003
- Control of Major Accident Hazards Regulations 2015
- Ionising Radiations Regulations 2017
- Nuclear Safeguards Act 2018

**Nuclear & non-nuclear industrial sites**
- Radiological environmental protection
- Conventional environmental protection

![Environment Agency](image)

- Control of Major Accident Hazards Regulations 2015
- Environmental Permitting (England and Wales) Regulations 2016

**Non-nuclear industrial sites**
- Conventional health & safety
- Radiological protection

![HSE](image)

- Health and Safety at Work etc. Act 1974
- Control of Major Accident Hazards Regulations 2015
- Ionising Radiations Regulations 2017

**SEPA**

- Water Environment (Controlled Activities) (Scotland) Regulations 2011
- Pollution Prevention and Control (Scotland) Regulations 2012
- Control of Major Accident Hazards Regulations 2015
- Environmental Authorisations (Scotland) Regulations 2018
UK Government policy & strategy
UK Government policy & strategy

• Review of Radioactive Waste Management Policy, Cm 2919, 1995
• Decommissioning Policy, 2004
• Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom, 2007
• Scotland’s Higher Activity Radioactive Waste Policy, 2011
• UK Strategy for the Management of Solid Low Level Waste from the Nuclear Industry, 2016
• NDA Strategy, 2016 (to be revised in 2021)
• Implementing Geological Disposal – Working With Communities, 2018
• White Paper on Nuclear Decommissioning & Radioactive Substances (under development)
Legislative & regulatory developments
Nuclear Installations (Licensing and Insurance) Act, 1959

ARRANGEMENT OF SECTIONS

1. Licensing of sites for nuclear installations.
2. Revocation and surrender of licences.
3. Supplementary provisions as to licensing of sites.
4. Licensee's liability.
5. Provision of cover for licensee's liability.
6. Dangerous occurrences in connection with licensed sites.
7. Inspectors.
8. Offences—general.
10. Interpretation.
11. Expenses.
13. Channel Islands and Isle of Man.
14. Short title and commencement.

Nuclear Installations (Amendment) Act 1965

ARRANGEMENT OF SECTIONS

Chapter 6

Section
1. Duty of operator of nuclear installation.
2. Duty of certain foreign operators.
3. Duty of other persons causing nuclear matter to be carried.
4. Right to compensation for injury or damage caused by breach of duty.
5. Exclusion, extension or reduction of compensation in certain cases.
6. Satisfaction of claims by virtue of s. 1 or 2.
7. Jurisdiction, shared liability and foreign judgments.
8. General cover for compensation by virtue of s. 1 or 2.
9. Special cover for licensee's liability.
10. Supplementary provisions with respect to cover for liability by virtue of s. 1 or 2 in respect of carriage.
11. Clear site licences.
13. Illustration.
15. Channel Islands, Isle of Man, etc.
16. Repeals and amendment.
17. Short title and commencement.

Schedule—Inquiries into occurrences in connection with licensed sites.

Chapter 57

Miscellaneous amendments of Act of 1959.

Enactments repealed.
Delicensing

- Criterion for delicensing nuclear sites (May 2005):
  “A demonstration that any residual radioactivity, above background radioactivity, which remains on the site, which may or may not have arisen from licensable activities, will lead to a risk of death to an individual using the site for any reasonably foreseeable purpose, of no greater than 1 in a million per year”

- Delicensing guidance (August 2008)
AMENDING THE FRAMEWORK FOR THE FINAL STAGES OF NUCLEAR DECOMMISSIONING AND CLEAN-UP

Government response to consultation

October 2018

CONSULTATION ON THE REGULATION OF NUCLEAR DECOMMISSIONING - AMENDING THE FRAMEWORK FOR THE FINAL STAGES OF NUCLEAR DECOMMISSIONING AND CLEAN-UP

Department for Business, Energy & Industrial Strategy

DISCUSSION REGULATING NUCLEAR SITE DECOMMISSIONING CLEAN-UP

November 2016

1. INTRODUCTION

The Radioactive Substances Policy Statement (RSPS) is set by DECC, which oversees the development, legislation and regulation in the UK. NDA is the environment agency that is responsible for overseeing the nuclear licensed sites. This has the potential to increase the costs and the opportunities for enhancing, to develop new regulatory regime for the decommissioning process. The Proportionate Regulatory Committee assessed options for more proportionate stages of decommissioning to ensure that it is optimised and sustainable. This has led to a significant change in the preferred option which is discussed later in this paper.

2. RECOMMENDATIONS TO THE ONE OFFICE

The Office for Nuclear Regulation (ONR) is working with NDA, DECC and the Department for Business, Energy and Industrial Strategy (BEIS) to develop a new legislative framework for the decommissioning process. The ONR is responsible for ensuring that the decommissioning process is conducted in a safe and effective manner. The ONR has been working with the other agencies to develop a new legislative framework for the decommissioning process. This framework is intended to ensure that the decommissioning process is conducted in a safe and effective manner. The ONR has been working with the other agencies to develop a new legislative framework for the decommissioning process. This framework is intended to ensure that the decommissioning process is conducted in a safe and effective manner. This has led to a significant change in the preferred option which is discussed later in this paper.

ISSUES FOR STRATEGIC DECISION

Regulating nuclear site decommissioning

The Office for Nuclear Regulation (ONR) is responsible for ensuring that the decommissioning process is conducted in a safe and effective manner. The ONR has been working with the other agencies to develop a new legislative framework for the decommissioning process. This framework is intended to ensure that the decommissioning process is conducted in a safe and effective manner. The ONR has been working with the other agencies to develop a new legislative framework for the decommissioning process. This framework is intended to ensure that the decommissioning process is conducted in a safe and effective manner. This has led to a significant change in the preferred option which is discussed later in this paper.

A PAPER BY: JN

CLEARED: EF

OFFICIAL

ONR REGULATORY COMMITTEE

Meeting Date: 23 February 2016

Type of Paper: For approval

F00 Status/Exemption: Closed (goes under key topic)

Keywords: Proportionate regulatory regime

Title: Proportionate Regulatory Controls

Proportionate Regulatory Controls on their Site End State

Preferred Option

Version 1.0

02 December 2015
Disposal of radioactive waste

- Removal
- Deposit
- Destruction
- Discharge
  - into water
  - into air
  - into a sewer or drain or otherwise
- Burial
  - underground
  - otherwise

Release from Radioactive Substances Regulation (RSR)

- Five principles
- 15 requirements (technical & managerial)
- Waste management plan
- Site-wide environmental safety case
- Risk guidance level: $10^{-6}$ per year
- Inadvertent human intrusion dose guidance level: 3 mSv per year, 20 mSv in total
- Release from RSR when operator demonstrates:
  - all disposals of radioactive waste have ceased
  - the site reference state has been achieved
Aims of the GRR

i. The GRR requires optimised plans for the management of radioactive wastes from decommissioning and clean-up of a nuclear site.

ii. The GRR has specific standards that must be met if those optimised plans identify that radioactive wastes are best managed by on-site disposal.

iii. The nuclear site must meet the GRR’s regulatory standards to enable it to be released from RSR.
R1 Requirement 1: Optimisation of waste management options

R13 Requirement 13: Optimisation of on-site disposals

R1: Waste management options*
- Landfill
- Off-site treatment
- Recycling

R13: On-site disposal
- Decontaminate?
- Immobilise in grout?
- Engineering design?
- Emplacement method?

*Management options shown here are not exhaustive and are for illustration purposes only
Entombment
Entombment

*entombment.* The encasing of part or all of a *facility* in a structure of long lived material for the purposes of *decommissioning.*

1. *Entombment* is not considered an acceptable strategy for *decommissioning a facility* following planned *permanent shutdown.*

2. *Entombment* may be considered acceptable only under exceptional circumstances (e.g. following a *severe accident*). In this case, the *entombment* structure is maintained and *surveillance* is continued until the *radioactive* inventory decays to a level permitting termination of the *licence* and unrestricted *release* of the structure.

- Full alignment of understanding and agreement on the meaning of ‘entombment’ between IAEA & the UK:
  - not an acceptable strategy / plan
  - may be acceptable in exceptional circumstances
- Entombment is not the same as in-situ disposal
Key messages
Any questions?