Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

The United Kingdom of Great Britain and Northern Ireland
NATIONAL REPORT PRESENTATION
for the
Third Review Meeting
11th to 20th May 2009
Vienna

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

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and

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Presentation Structure

Morning

- Introduction
- Overview of Radioactive Waste and Spent Fuel Management in the UK
- Major Developments since 2006
- Action on Challenges from last Review Meeting
- Current Challenges
- Significant Events since last Review Meeting

Afternoon

- Questions and Comments
- Planned measures to improve safety
- Summary

The UK Report

- Prepared from inputs of Government Departments, Regulatory Bodies, and Industry
- Explains how the UK achieves and maintains a high level of safety and environmental protection in spent fuel and radioactive waste management

Scope

- ✓ Reprocessing
- X Naturally occurring radioactive material
- X Defence programme waste

National Overview

- Regulatory Bodies and overall objectives of National Arrangements
- Overview of:
  - policy
  - funding of liabilities
  - current practices and
  - planned practices

Regulatory Bodies

- Health & Safety Executive (**HSE**) / Nuclear Installations Inspectorate (**NII**)
- Environment Agency (**EA**) or Scottish Environment Protection Agency (**SEPA**)

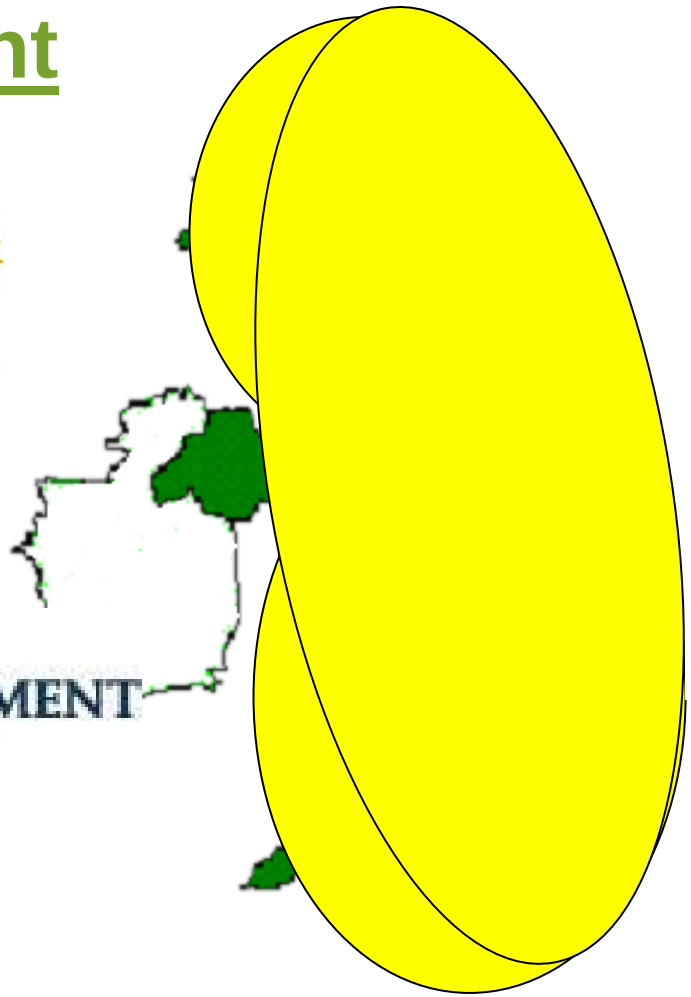
Regulatory Bodies

National Overview

Environment

SEPA
Scottish Environment Protection Agency

ENVIRONMENT AGENCY



Safety

HSE
Health & Safety Executive

Northern Ireland

There are no nuclear installations in Northern Ireland

Northern Ireland has its own regulatory system and bodies that parallel those in the rest of the UK

Regulatory Framework

Nature of UK Regulatory Framework

- Goal Setting
  - Minimisation of risk so far as is reasonably practicable
  - ALARP / ALARA / BPEO / BPM
- Emphasis in legislation
  - Responsibilities and competence of Operators
  - Robust arrangements
  - Early, open and transparent engagement

Regulatory System

Nuclear Site Licence

HSE grant this under the Nuclear Installations Act, and can attach conditions:

- In the interests of safety
- With respect to handling, treatment and disposal of nuclear matter

Nuclear Site Licence applies to all people on the site. The site licensee is responsible for ensuring compliance

Regulatory System

Licence Conditions

Goal setting:

"Licensee must make and implement adequate arrangements"

"Adequate arrangements" can be tailored to:

- Suit business need
- Suit the stage of operation – from construction to decommissioning

Covers various aspects including radioactive waste management and decommissioning

Regulatory System

Disposal Authorisation

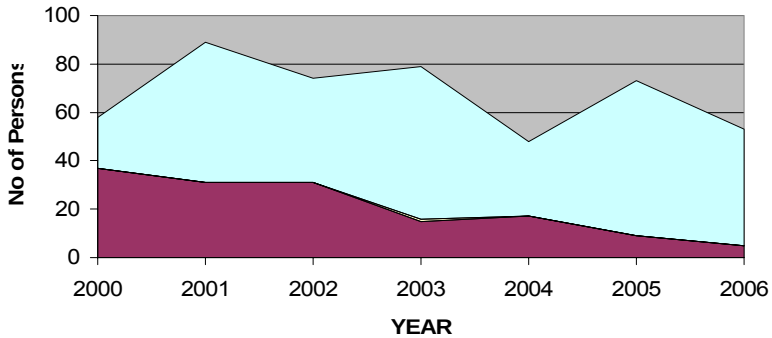
- Prior authorisation needed from EA or SEPA for the discharge and disposal of radioactive waste
- Determining an application involves appropriate consultation with stakeholders e.g. HSE, FSA, Local Authority, public
- Reviewed periodically
- Attach conditions to the authorisation

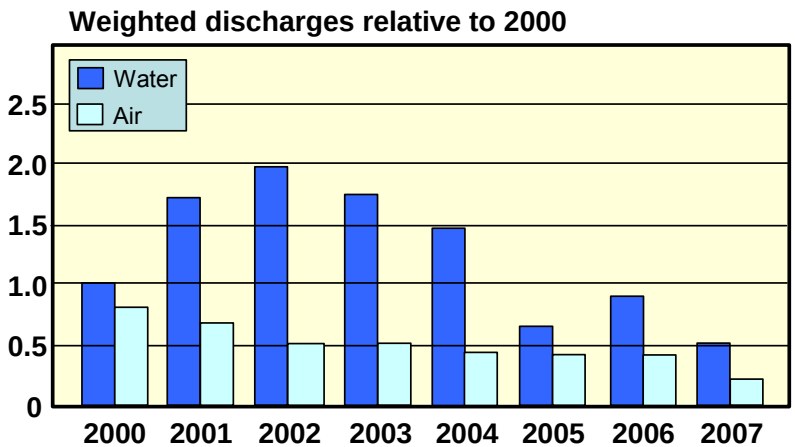
Basic Policy
Safety and Environment

UK Government's basic policy is to ensure adequate statutory powers and other measures to protect people and the natural environment from harmful levels of radioactivity

Basic Policy
Safety and Environment

National Overview





Trends in radioactive discharges to water and air

- Must meet LIMITS and
- Reduce further in line with:

ALARP/BPEO/BPM

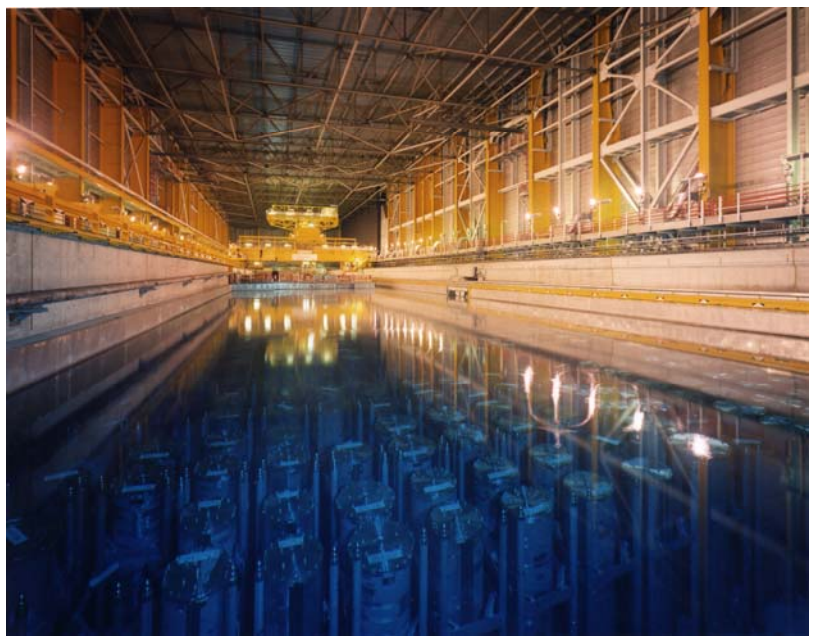
(Taking into account all relevant factors)

Overview - Policies

Specific Policies for:

- Spent Fuel Management
- Nuclear Fuel Cycle and Application Wastes Management
- Decommissioning and
- Disused Sealed Sources

Spent Fuel



- Reprocess/not reprocess - commercial judgment of the owners
- Spent fuel is not waste while the option of reprocessing the fuel remains open
- The current assumption is that the spent nuclear fuel from new UK reactors will not be reprocessed

Definition of Waste

Definition of Waste

- It is the decision of the owner of any radioactive material as to whether there is any foreseen use and hence whether it is radioactive waste
- Regulatory control is the same under nuclear licensing whether or not it is declared as waste – hence the type and level of regulatory control does not depend on such decisions by the owners

Radwaste Management General

- Sustainable development principles
- Application of the waste hierarchy
- Wastes to be safely and appropriately managed, treated, and then disposed of in ways which protect public, workforce and the environment

Categorisation

- **VLLW**
  - Can be disposed of with ordinary refuse
  - <400kBq ($\beta\gamma$) in 0.1m3, <40kBq ($\beta\gamma$) per item
- **LLW**
  - not exceeding 4GBq/te (α) or 12 GBq/te ($\beta\gamma$)
- **ILW**
  - Greater specific activity than LLW but no need to consider self heating
- **HLW**
  - Need to consider self heating

Higher Activity Wastes

(HLW, ILW and LLW not suitable for existing LLW disposal facilities)

- Safe and secure interim storage, followed by:
  - (England and Wales) geological disposal
  - (Scotland) long term near site near surface storage
- More details later under developments since 2006

Low Level Waste

- Priorities
  - Minimise creation
  - Greater flexibility than currently exists
  - Maintain focus on safety and environmental protection
  - Create a UK wide strategy

Discharges

Based on optimisation: Best Practicable Environmental Option (BPEO) and Best Practicable Means (BPM)

- Progressive reduction of discharge limits

Decommissioning

- Progressive reduction of hazards
- As soon as reasonably practicable
- Development of Strategies and plans
  - The objective of a strategy is to get the best solution overall taking into account the needs of the environment, and safety of workers and the local community

Disused Sealed Sources

- The holder is responsible for any disused sealed sources until:
  - returned to supplier
  - transferred to another holder
  - sent for storage, disposal or recycling
- The holder is also responsible for security and financial provision

Overview - Funding

Funding arrangements etc. for:

- General Liabilities
- NDA owned sites
- New Build Reactors and
- Disused Sealed Sources

General Funding

- It is the responsibility of the waste owners to provide funds for radioactive waste/ spent fuel management and decommissioning
- The published audited accounts of UK operators include details of waste management costs and of the provisions made in order to meet them

NDA Owned Sites

- Site Licensees may charge radioactive waste & spent fuel management and decommissioning costs to the NDA provided they are incurred in compliance with their contract
- NDA is funded directly from central Government, through its sponsoring Department, DECC

New Build Reactors

- A Funded Decommissioning Programme (FDP), approved by Government, must be in place before construction
- The Nuclear Liabilities Financing Assurance Board (NLFAB) will scrutinise the financing plans
- Arrangements have had the benefit of consultation

Disused Sealed Sources

High-Activity Sealed Sources (HASS) Regulations require financial provision for disposal or an acceptable alternative (for example, return to supplier) when sources are acquired

Disused Sealed Sources

Legacy

UK Government funded programme 2004-2008

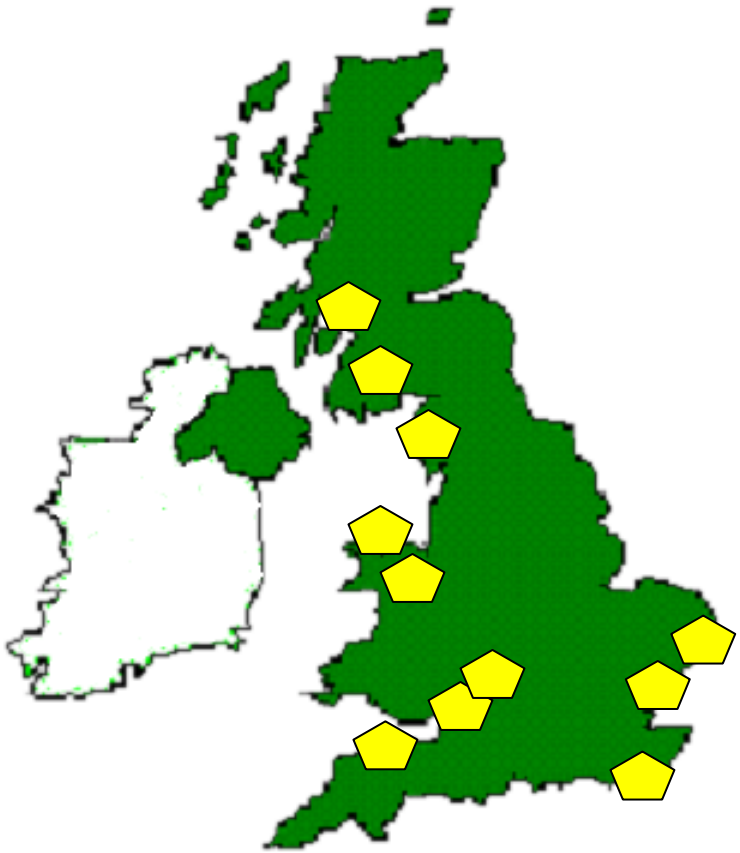
Contingency funds for removal of orphan sources

Overview – Current Practices and Facilities

UK Facilities

Magnox Stations

Magnox Stations



- Berkeley
- Bradwell
- Calder Hall
- Chapelcross
- Dungeness A
- Hunterston A
- Hinkley Point A
- Sizewell A
- Trawsfynydd

- Oldbury
- Wylfa

AGR and PWR Stations

Overview
Current Practices
UK Facilities

AGR and PWR Stations

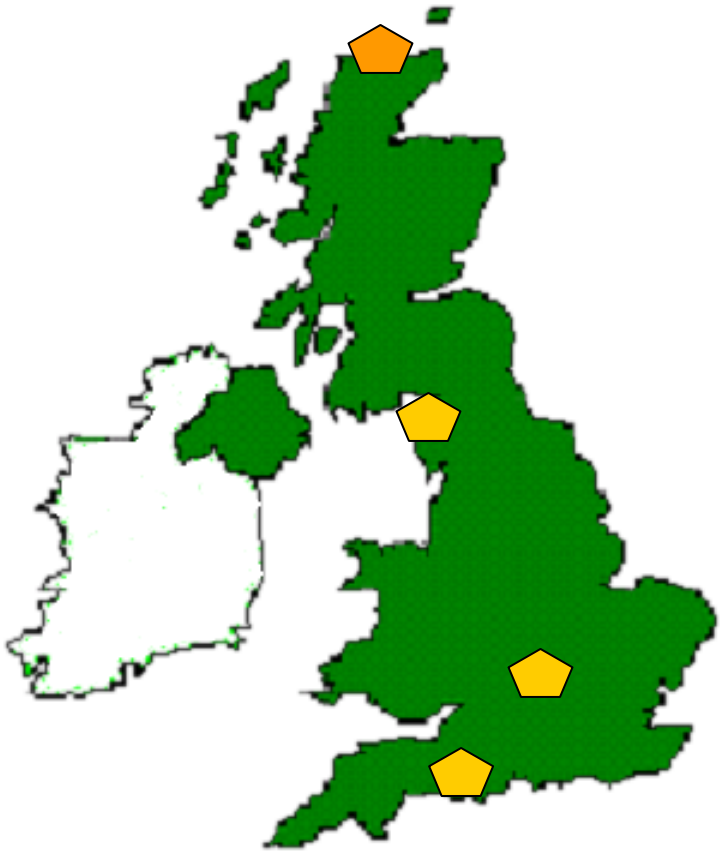
AGR Stations

- Dungeness B
- Hartlepool
- Heysham I and II
- Hinkley Point B
- Hunterston B
- Torness

PWR Station

- Sizewell B

Research Sites



- Dounreay
- Windscale
- Harwell
- Winfrith

Overview – Current Practices and Facilities

Spent Fuel Management Facilities

Storage

Magnox Stations

- Wet storage for at least 90 days - except Wylfa dry storage

AGR Stations

- Wet storage for at least 100 days

PWR Station

- Long term storage in ponds

Storage

Sellafield

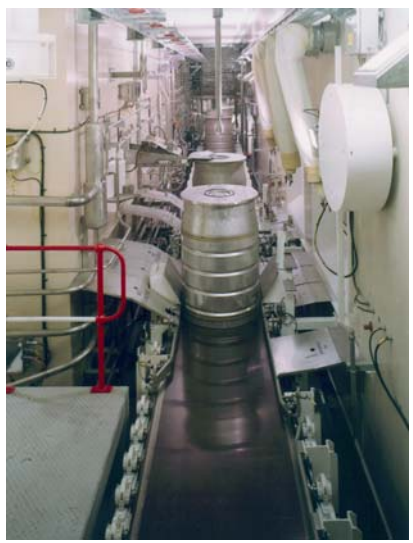
Storage in various ponds awaiting reprocessing or for long term storage

Reprocessing

Sellafield

- Magnox
- Thorp

Overview – Current Practices and Facilities



Fuel cycle and application waste management

Waste Storage

Magnox Stations

- Underground vaults
- Above ground vaults
- Voids
- Tanks

AGR and PWR Stations

- Voids
- Wet waste storage tanks
- Desiccant storage
- Ion exchange resin storage tanks

Waste Storage

Other Fuel Cycle Sites

- Engineered Stores
- Vaults and Silos
- ILW liquid waste tanks
- HLW tanks
- Miscellaneous stores

Application Waste

- Decay storage in stainless steel drums

Waste Processing

- Vitrification
- Cementation
- Decontamination
- Compaction
- Sorting, segregation and repacking

Waste Disposal

Low level waste disposal to specific facilities

Very low level waste disposal to landfill sites

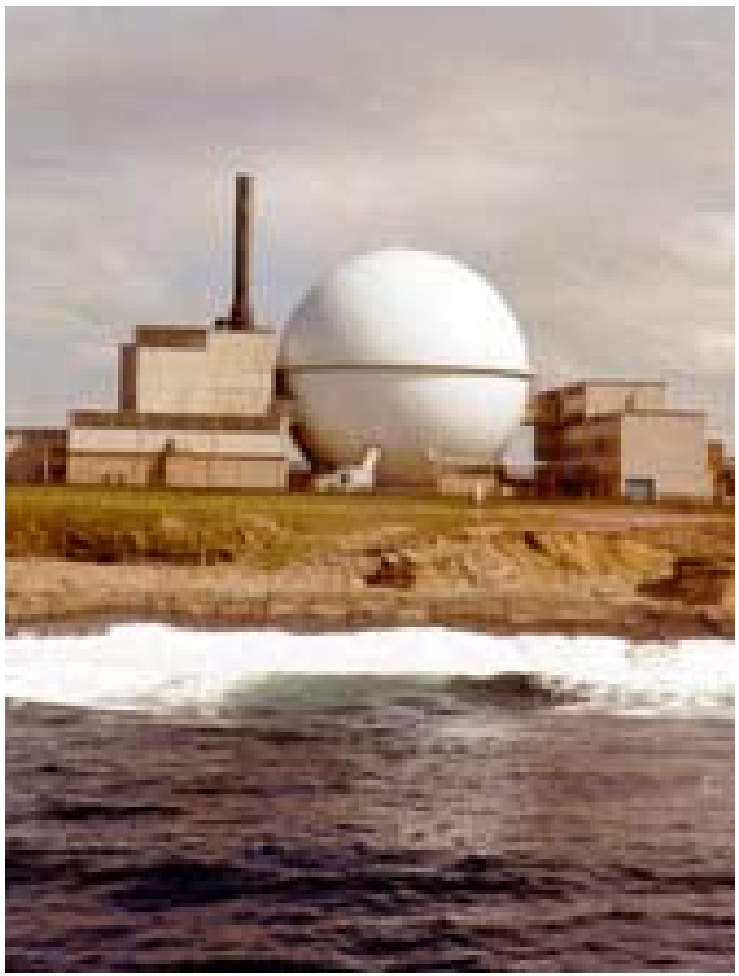
Overview – Current Practices and Facilities

Decommissioning Liabilities

Magnox Stations

- Berkeley
- Bradwell
- Calder Hall
- Chapelcross
- Dungeness A
- Hinkley Point A
- Hunterston A
- Sizewell A
- Trawsfynydd

Research Sites



Sites being decommissioned

- Dounreay
- Windscale
- Harwell
- Winfrith

UK Decommissioned Sites

Fully Decommissioned Sites

Research Reactors at:

- Scottish Universities
- Northern Universities
- ICI Billingham

Planned Facilities

Fuel Cycle Waste – One additional store is under construction for reprocessing waste

Decommissioning Liabilities – 5 facilities under construction at three sites Sellafield, Harwell and Dounreay . Others to be constructed as the decommissioning challenge progresses

Disused Sealed Sources – future location identified as the Geological Disposal Facility (GDF)

Major Developments since 2006

Dr M Weightman

- Nuclear Safety Policy
- Organisational
- Nuclear Safety Guidance

Dr J McHugh

- Environmental Policy
- Organisational
- Environmental Guidance

Nuclear Safety Policy

Major Developments since 2006

White Papers Energy/nuclear power

- Government confirmed nuclear power option as part of energy strategy

New Build

- Legislative arrangements to secure financing arrangements for decommissioning and waste management costs

Government and Regulator

Major Developments since 2006

DECC

- departmental reorganisations

HSE

- OCNS and Safeguards joined
- merger of Executive and Commission
- change of status of NII – independent nuclear regulatory body

Licensees

Major Developments since 2006

Licensee restructuring & PBOs

Site(s)	Licensee	PBO
Sellafield, Calder Hall, Windscale, Capenhurst	Sellafield Ltd	Nuclear Management Partners Ltd (NMP) [from 24/11/2008]
Chapelcross, Hunterston A, Trawsfynydd, Wylfa, Oldbury	Magnox North Ltd	*Energy Solutions (to be competed)*
Berkeley; Bradwell; Dungeness A; Hinkley Point A & Sizewell A	Magnox South Ltd	*Energy Solutions (to be competed)*
Dounreay	Dounreay Site Restoration Ltd	*UKAEA ltd (to be competed)*
Harwell, Winfrith	Research Sites Restoration Ltd	*UKAEA ltd (to be competed)*
LLW repository	LLW Repository Ltd	UK Nuclear Waste Management Ltd (UKNWM Ltd) [from 1/4/2008]
Springfields	Springfields fuels Ltd.	*Westinghouse Electric UK Ltd (to be competed)*

Nuclear Safety Guidance

Major Developments since 2006

HSE's Safety Assessment Principles (SAPs)

- Revision of the SAPs based on IAEA safety standards was finalised in 2006

Joint Guidance

- management of higher-activity wastes on nuclear licensed sites

MRWS Policy

Geological disposal policy, June 2008

Policy covers HLW, ILW and some LLW

MRWS Policy

Policy is based on:

- geological disposal
- safe and secure interim storage
- R&D – optimised implementation

Programme timing is flexible

- need to maintain momentum recognised

Geological Disposal Policy

Major Developments since 2006

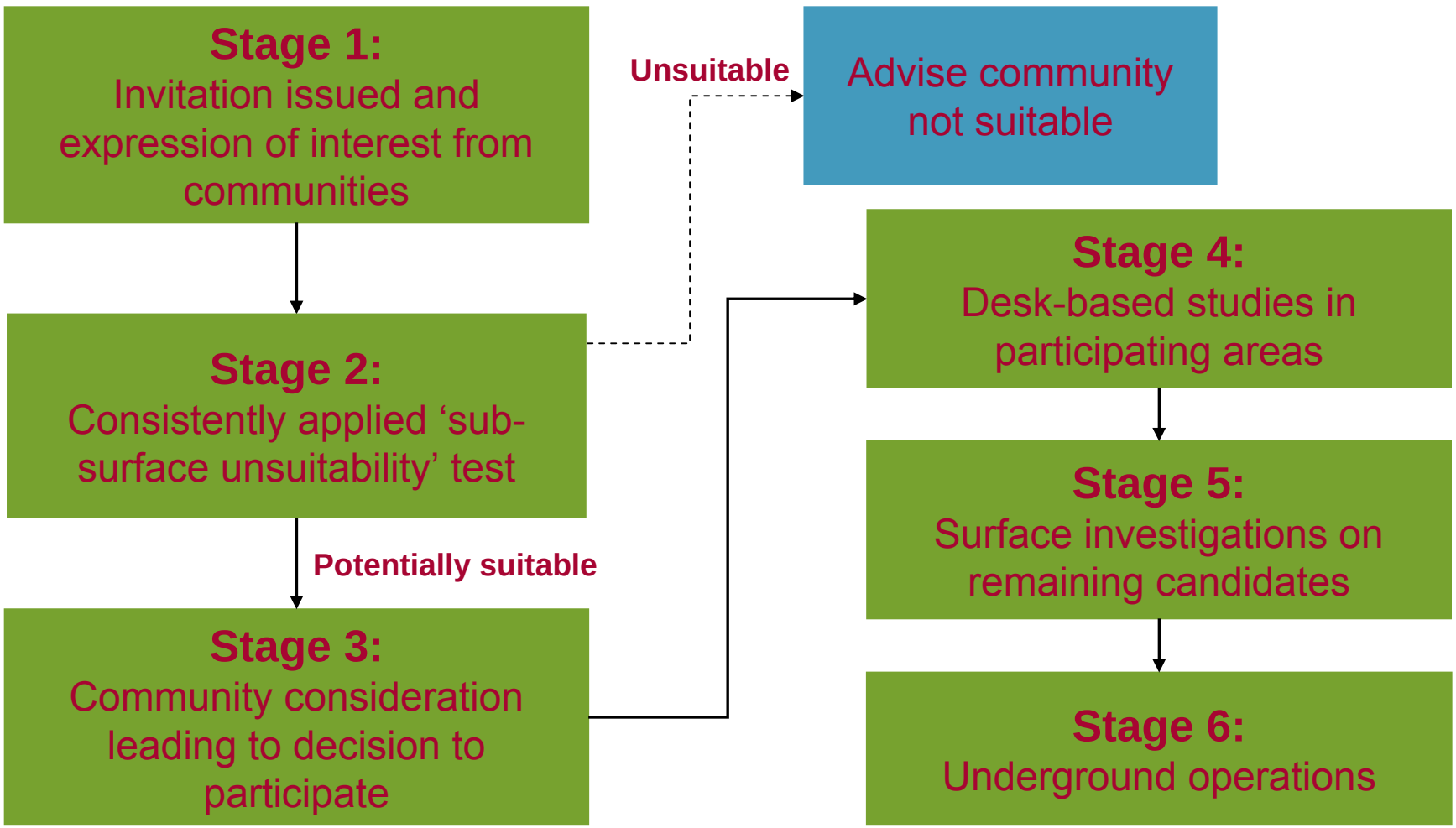
Site selection process based on partnership with volunteer communities

Invitations to local authorities to express an interest in hosting a facility

- 3 local authorities expressed interest (April 09)

Geological Disposal Policy
Site Selection Process

Major Developments since 2006



Nuclear Decommissioning Authority (NDA)

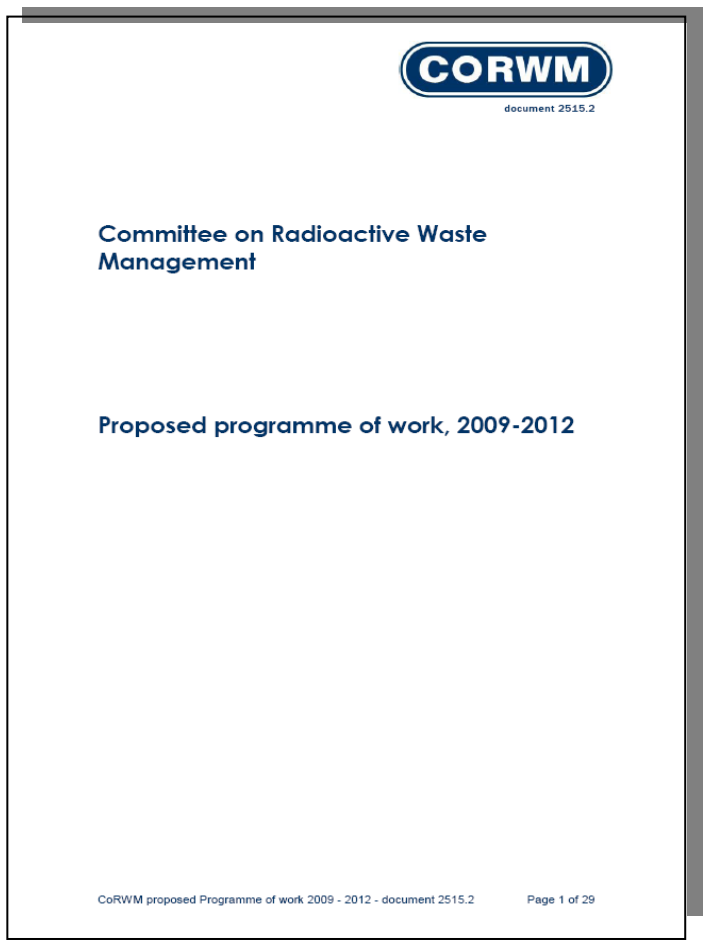
Major Developments since 2006

NDA Radioactive Waste Management Directorate

- set up to deliver a geological disposal facility
- incorporates UK Nirex
- provides advice on conditioning and packaging of radioactive waste

Committee on Radioactive Waste Management (CoRWM)

Major Developments since 2006



CoRWM has been reconstituted

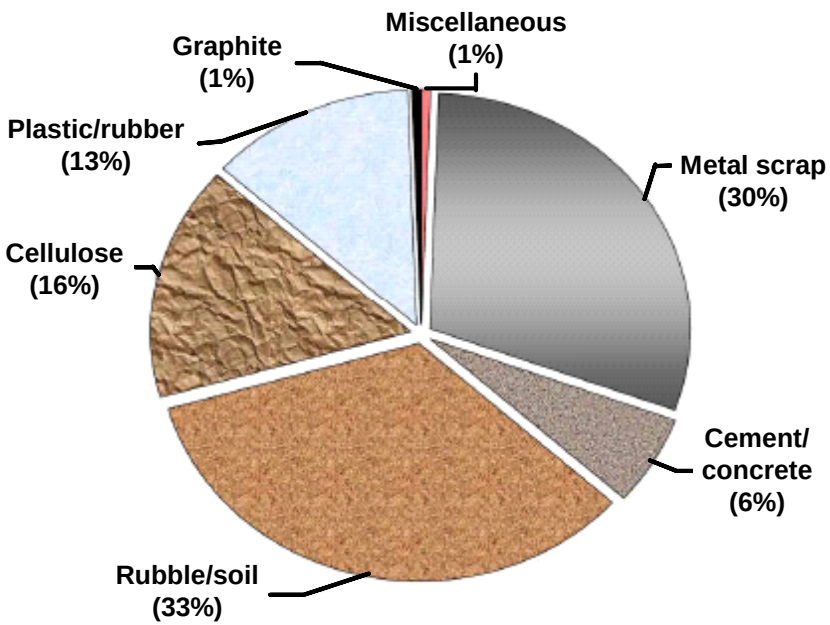
Provides independent scrutiny and advice to UK Government

Open and consultative approach

Low Level Radioactive Waste

Major Developments since 2006

Types of material in LLW inventory



Low-level radioactive waste (LLW) policy, March 2007

Policy covers generation, management and regulation of solid LLW

Policy applies across the UK

LLW Categories

LLW is defined as not exceeding 4000 MBq/te α or 12000 MBq/te $\beta\gamma$

Two sub-categories recognised:

- **High volume very low level waste (HV-LLW)**
  Maximum activity of 4 MBq/Te; controlled disposal
- **Low volume very low level waste (LV-VLLW)**
  Activity <0.4 MBq (or <4 MBq H-3 or C-14) per 0.1m³; safe for disposal with other wastes

LLW Repository

Major Developments since 2006

Low Level Waste Repository (LLWR) at Drigg

- principal route for disposal of solid LLW disposal

Revised authorisation in May 2006

- allows disposal in current disposal area to continue

LLW Repository

Major Developments since 2006

Planning permission for new disposal area granted January 2008

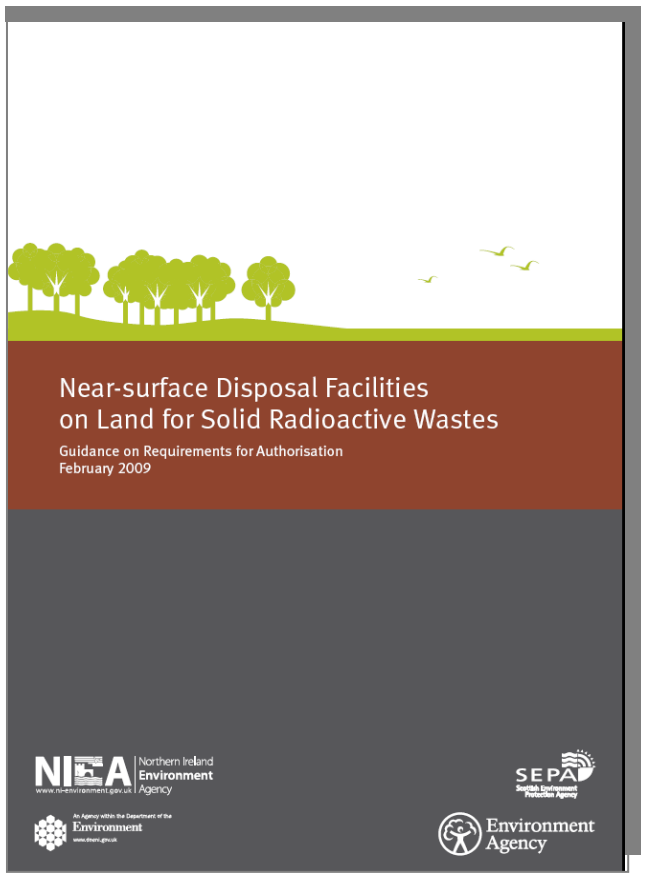
New disposal area will need authorisation

- Review of site radiological capacity and disposal limits

Updated Environmental Safety Case required by May 2011

Regulatory Guidance

Major Developments since 2006



Updated 'Guidance on Requirements for Authorisation' published February 2008 for:

- Near-surface disposal facilities
- Geological disposal

Principles and requirements for long-term protection of people and the environment

Radioactive Discharges

Draft ‘UK Strategy for Radioactive Discharges 2006-2030’, published June 2008

Includes aerial and liquid discharges from:

- nuclear industry
- non-nuclear sector (e.g. hospitals, universities and research laboratories)
- decommissioning as well as operational activities

Radioactive Discharges

Expect progressive reductions in:

- radioactive discharges
- concentrations of radionuclides in the marine environment - by 2020, should add close to zero to historic levels
- human exposures to ionising radiation resulting from radioactive discharges

Environmental Principles

Environment Agency's draft Radioactive Substances Regulation Environmental Principles' (REPs) published June 2008

Standardised framework for regulatory decision-making

Require operators to apply BAT

Action on Challenges from last Review Meeting

The UK has made, and will continue to make, progress on many of the issues highlighted in the second review meeting

Notably -

Complete Review of Options for Very Low Level Waste

Completed in March 2007

Priorities:

- Minimise creation
- Greater flexibility
- Maintain focus on safety etc.
- create a UK wide strategy
- NDA tasked with delivery

Review the classification system for radioactive waste

UK classification has been modified for VLLW to distinguish low and high volumes

- **Low Volume VLLW:** safely disposed of to an ***unspecified*** destination <400kBq (total) and <40kBq (single items)
- **High Volume VLLW** waste <4MBq/te can be disposed of to specified facilities

Finalise Contaminated Land Regulations

The Radioactive Contaminated Land Regulations 2006, as amended in 2007, were introduced to put into place certain requirements of the Basic Safety Standards Directive in England and Wales

Similar enactments apply in Scotland and Northern Ireland

Identify contaminated land sites requiring remediation

Contaminated land on nuclear sites regulated under licensing regime

Number of non nuclear affected sites is uncertain

The person who caused the contamination will be responsible for remediation - if they cannot be found the owner or occupier of the land will be responsible

The relevant environment agency will regulate remediation

Complete review of remaining capacity of the LLW repository near Drigg (3 – 5 years)

Work is ongoing

Target for completion of national LLW operational strategy is December 2009

Complete the evaluation of options for management of spent fuel (2007)

NDA has carried out an initial review of spent fuel management as described in UK's third national report

Current Challenges

Large amount of decommissioning – e.g.

MAGNOX Reactors Decomm. Progress	Ceased Generation	Fuel removed
Bradwell	Y	Y
Calder Hall	Y	N
Chapelcross	Y	N
Dungeness A	Y	N
Hinkley Point A	Y	Y
Hunterston A	Y	Y
Oldbury	N	N
Sizewell A	Y	N
Trawsfynydd	Y	Y
Wylfa	N	N

Strategy for all materials

NDA conducting reviews of:

- Radioactive waste storage
- Spent fuel management
- U and Pu disposition

Spent Fuel Management

Magnox and Oxide operating plans

- Magnox reprocessing until ~2016
- AGR reprocessing until ~2015

AGR fuel storage:

- Wet storage for fuel not being reprocessed
- Fuel drying and dry storage being evaluated

High Active Liquid Waste

HA Evaporators and Storage Tanks

- New evaporators /storage tanks being procured to ensure adequate capacity when the current plant ends its service life
- Controls are in place to ensure that HAL arisings do not exceed the capacity of the site to manage them

LLW Disposal Capacity

- **Calder Landfill Extension Segregated Area**
  - application expected which will more than double the available space
- **Clifton Marsh Disposal Facility**
  - The future, after 2012, is uncertain - depends operator's business plans
- **Dounreay LLW disposal facility**
  - On-site facility for LLW disposal closed in 2005
  - a new LLW near-surface facility is planned

Significant Events since last Review Meeting

THORP Clarification Cell Event

- Leakage of ~83,000 litres liquor in 8 months prior to 20 April 2005
- Cat ‘3’ on INES
- Cause was motion induced fatigue
- Sellafield Ltd prosecuted by HSE and fined by the court
- Learning Points
  - Attention needed to maintaining barriers
  - Adequate safety culture is important

Answers to Questions Received

142 Questions received

from

22 Countries

Written answers have been provided to all questions

Answers to Questions Received

Cannot present all questions and answers

Key themes in questions presented (where not covered elsewhere in the presentation)

Regulatory Control

Answers to Questions

How does the UK maintain consistency across devolved administrations?

- Devolved administrations in Scotland, Wales (and Northern Ireland)
- UK Parliament responsible for legislation on Health and Safety and on Nuclear Safety
- Scotland and Wales have powers over environmental matters
    - Policy can be different

Regulatory Control

Staged regulation of geological disposal

- UK Government planning to implement under Environmental Permitting Regulations (EPR)
- EPR will replace Radioactive Substances Act 1993 in England and Wales
  - New powers for regulation of geological disposal from start of intrusive site investigation
  - EPR will not apply in Scotland but existing regulatory control will continue to apply

Regulatory Control

Radioactive Substances Regulation Environmental Principles (REPS)

- Take account of legislation and Government policy
- Framework for technical assessments and judgements
  - Complementary to HSE's Safety Assessment Principles
- REPs revised to reflect consultation comments - publish later in 2009

Regulatory Control

Licence and Authorisation Conditions to govern nuclear sites

- Licence and Authorisation Conditions have legal status - non-compliance is a criminal offence
- Effect similar to regulations
- Benefit: easier to change Conditions than regulations
  - can react to changing needs without amending legislation

Low Level Waste Disposal

Answers to Questions

Capacity

- National LLW strategy being implemented
  – includes planning for future capacity
- LLW Repository: potential capacity to 2020
  – capacity under review
- Dounreay: new disposal facility planned
  – on-site disposal ceased in 2005
- VLLW – policy allows more disposal options
  – disposal of high volume VLLW to specified landfills

Low Level Waste Disposal

Waste acceptance criteria

- Responsibility of disposal facility operator
- Regulatory control through authorisations of waste producers and disposal facility operator
- Disposal of VLLW – control through waste producers' authorisations
  - Authorisation required for specialised VLLW disposal facility

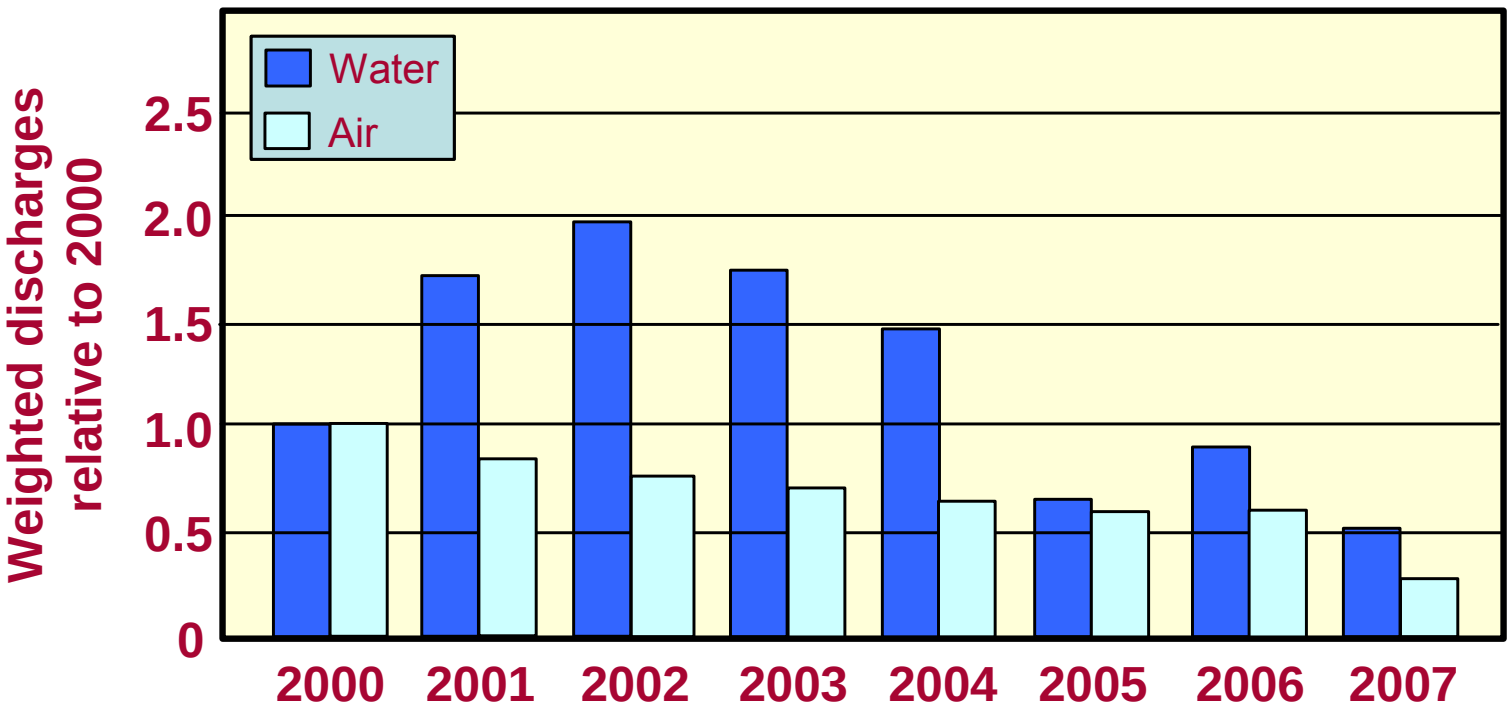
Low Level Waste Disposal

Institutional control

- 2002 safety case for LLW Repository – put no reliance on institutional control beyond 2150
  - ~100 years after expected closure
- No parameters for deciding when to withdraw control specified in regulatory guidance
  - Reasonable arrangements must be in place to fund closure
  - Unlikely to accept period longer than ~ 300 years

UK Discharge Strategy

Answers to Questions



- Data for nuclear industry in England and Wales

Beach Monitoring


Monitoring vehicle

Dounreay

Sand grain sized particles of irradiated fuel released with liquid effluent from 1963 to 1984

Sellafield

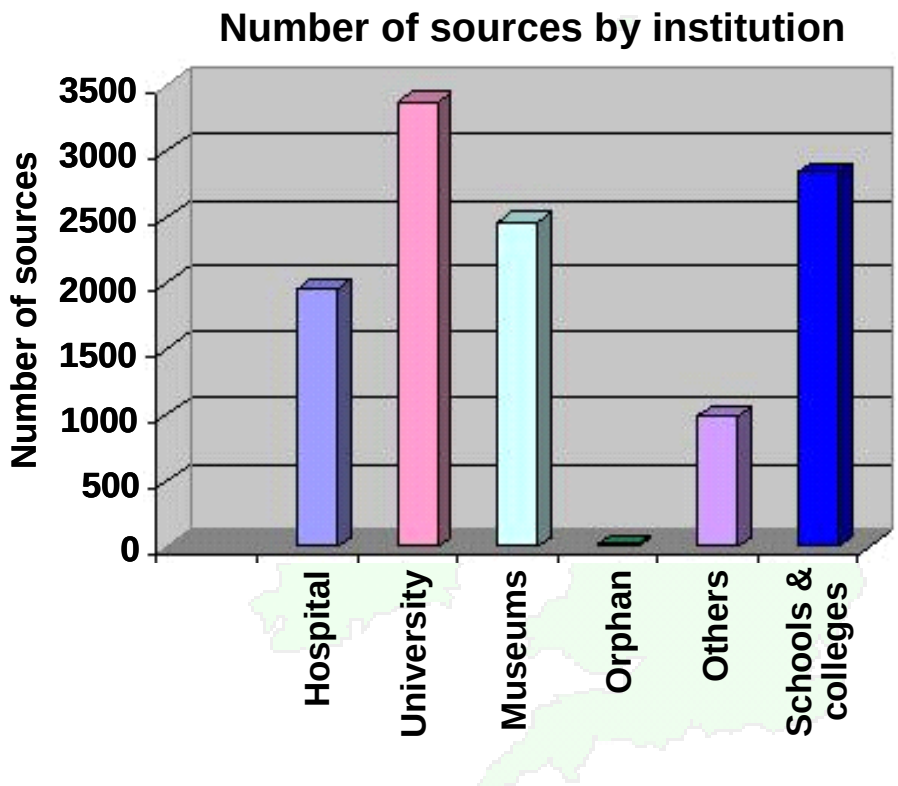
Over 600 finds recovered from 4.4 km^2 (April ’09)

– Two groups: α-rich (Pu, Am) and β-rich (Cs-137)

Disused Radioactive Sources

Answers to Questions

‘Surplus Source Disposal Programme’



Purpose: Removal to secure long-term storage, recycling or disposal sites
Duration: 2004-2008
Cost: £7.14M (~ US $10.4M) – UK Government
Over 11,000 sources removed
– **Total activity >850 TBq**

Regulators

Answers to Questions

The Plant Safety Review process -

- At all times safety must be substantiated and documented (Safety Case)
- major reviews of safety
- normally carried out every ten years
- identify shortfalls against modern standards
- leads to a programme of reasonably practicable improvements

HSE assesses on a sample basis

Stakeholders

How are stakeholders views taken on board?

Examples

- The planning application process
- Site Stakeholder Groups (SSGs)
- National Stakeholder Group (NSG)
- Community Siting Partnership for geological disposal

Skills

Answers to Questions

National Skills Academy for Nuclear (NSAN)

- training to foundation degree level and apprenticeships
- HSE is a member of NSAN as an employer - no legal responsibility

National Nuclear Laboratory (NNL)

- identify and preserve key nuclear skills and facilities
- lead UK's strategic technology programmes

Skills

Ageing Profile in HSE/NII

- 70% over 50 (8%>60) - experienced regulatory inspectors
- challenges and opportunities include:
  - Knowledge Retention and Transfer
  - Leadership and Management Gaps
- need:
  - targeted recruitment activities
  - measures to enhance retention

  HSE's Nuclear Directorate moving to "Statutory Corporation" status – more flexibility to address these issues

Siting

Siting rules for radioactive waste management facilities vs. new reactors

- 2008 HSE demographics methodology for **all** types of nuclear facilities
- based on UK long standing nuclear siting policies updated to reflect international good practice

Spent Fuels

Spent Fuel from new reactors

- Planning assumption - spent fuel stored until a disposal route becomes available
- Requesting Parties commissioned work to assess the 'disposability' of spent fuel
- Disposability assessments are not complete - no indication that the new reactor fuel will raise unique disposability issues

Spent Fuels

‘Exotic’ Spent Fuel

- NDA is developing disposition options for its non-standard fuels, commonly referred to as ‘Exotics’
- Storage regime dependent on
  - the physical properties of the fuel
  - length of storage period required

Planned measures to improve safety

Planned measures to improve safety

Environmental Improvements

- UK discharge strategy
- Environmental Permitting

Safety Improvements

Planned measures to improve safety

- Progress in decommissioning
- Focus on high hazard plants

Institutional Improvements

- Institutional changes to facilitate improvements

Summary

The UK has made, and will continue to make, progress on many of the issues highlighted in the second Review Meeting, notably :

Summary

Review of Policy

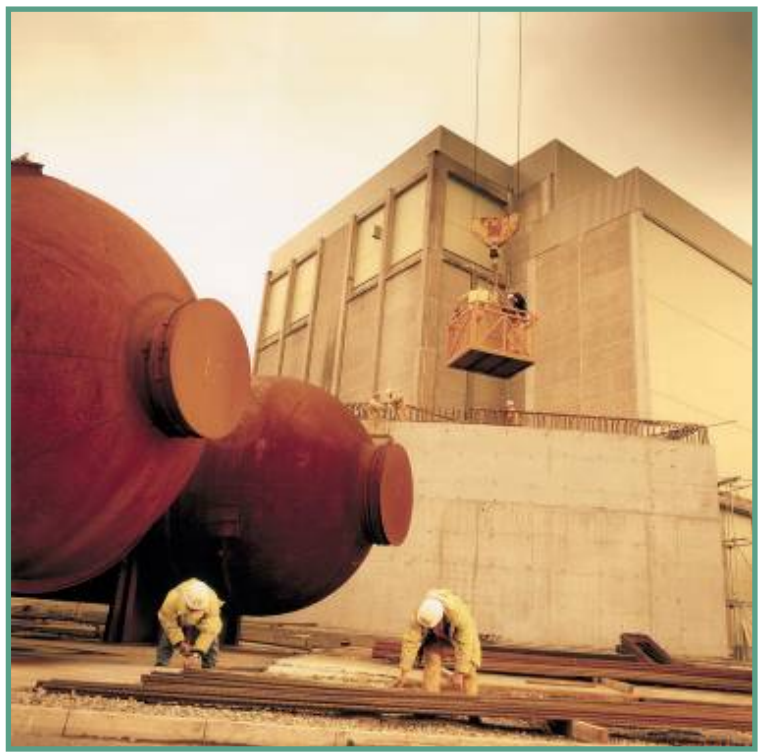
- geological disposal plus safe and secure storage

Organisational changes

- Nirex integrated into NDA – to progress GDF
- NDA restructured its estate and early PBO contracts awarded
- Nuclear Skills Academy established

Summary

Progress in Decommissioning



Successful progress in:

- safe shutdown, defuelling and decommissioning of Magnox Power Reactor fleet
- decommissioning of research sites
- decommissioning legacy plant at Sellafield

Summary

Progress in Radioactive Waste Management

Successful progress in:

- reducing liquid HLW stocks through vitrification
- repackaging PCM to modern standards
- treating active sodium from PFR

Summary

Learning from the past to better address today's issues and address future challenges

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

The United Kingdom of Great Britain and Northern Ireland
NATIONAL REPORT PRESENTATION
for the
Third Review Meeting
11th to 20th May 2009
Vienna