REPORT TO: **HOUSING, DUNDEE CONTRACT SERVICES & ENVIRONMENT SERVICES COMMITTEE (26th APRIL 2010)**

REPORT ON: **SCCORS COMMENTARY ON THE SCOTTISH GOVERNMENT'S HIGHER ACTIVITY RADIOACTIVE WASTE CONSULTATION**

REPORT BY: **HEAD OF ENVIRONMENTAL HEALTH & TRADING STANDARDS**

REPORT NO: **225-2010**

1.0 PURPOSE OF REPORT

1.1 The report seeks to confirm the views of the Council in response to the Scottish Government's Consultation document on "Scotland's Higher Activity Radioactive Waste Policy".

2.0 RECOMMENDATIONS

2.1 It is recommended that the committee:

i) welcomes the Scottish Government's paper and the opportunity to contribute our views
ii) notes and approves the SCCORS submission as detailed in the Appendix. In particular, the answers to specific questions asked within the Consultation document (see pages 9 and 10 of the Appendix)
iii) authorises the Head of Environmental Health and Trading Standards to issue the formal response to the Scottish Government by 30th April 2010.

3.0 FINANCIAL IMPLICATIONS

3.1 None.

4.0 MAIN TEXT

4.1 The Scottish Government has been conducting a major consultation exercise regarding Scotland's Policy on Higher Activity Radioactive Waste. The consultation is proposing to change the Scottish Governments current policy on the long term management of nuclear waste to include disposal, as well as storage, of Intermediate Level Waste (ILW). Most of Scotland's radioactive wastes are from nuclear power generation.

Dundee City Council is a member of SCCORS (Scottish Councils Committee On Radioactive Substances) a body which exists to advise Scottish Local Authorities on radiation matters. SCCORS was set up with the support of the Scottish Government and COSLA and Dundee City Council is the lead authority.

SCCORS commissioned Dr Ian Fairlie, an internationally recognised expert on radiation in the environment, who advises national and local governments across Europe, to produce independent factual advice on the contents of the consultation documents. SCCORS has circulated details of its response to the consultation to all SCCORS member Councils and a copy of the SCCORS submission is enclosed with these committee agenda papers.

The SCCORS report contains -

1 An explanatory introduction
2 A summary of SCCORS main recommendations
3 A commentary on the Scottish Government Consultation documents
4 Scientific references to the Commentary
5 A list of SCCORS answers to the questions asked by the Scottish Government Consultation Documents (see pages 9 and 10) Where scientific evidence is missing, SCCORS has taken the view that an answer is not possible.
6 An Appendix setting out the IAEA Principles of Radioactive Waste Management and the HSE Safety Assessment Principles for Nuclear Facilities

Copies of the Scottish Government consultation documents are available for members perusal via the Scottish Government website at -
http://www.scotland.gov.uk/Topics/Environment/waste-and-pollution/Waste-1/16293/8970

5.0 POLICY IMPLICATIONS

This report has been screened for any policy implications in respect of Sustainability, Strategic Environmental Assessment, Anti-Poverty, Equality Impact Assessment and Risk Management - there are no major issues.

6.0 CONSULTATIONS

6.1 The Chief Executive, Depute Chief Executive (Support Services), Director of Finance and Assistant Chief Executive have been consulted in relation to this report.

Albert Oswald
Head of Environmental Health & Trading Standards **April 2010**

APPENDIX

SCOTLAND'S HIGHER ACTIVITY RADIOACTIVE WASTE POLICY CONSULTATION 2010: SCCORS Commentary

Explanatory Introduction

The following represents the views of Dr Ian Fairlie.

The Scottish Councils' Committee on Radioactive Substances (SCCORS) was established in May 2009 with the support of CoSLA and the Scottish Government, and with funding from the NDA. The aim of SCCORS is to give independent factual advice to Scottish local governments on radiation and radioactivity matters. SCCORS is currently representative of 29 Scottish Councils.

The Scottish Government is consulting on a proposed "Detailed Statement of Policy for Scotland's Higher Activity Radioactive Waste". The Consultation is proposing to change the Scottish Government's current policy on the long term management of nuclear waste to include disposal, as well as storage, of Intermediate Level Wastes (ILW). The Scottish Government states the proposed policy is needed to allow radioactive waste owners and producers to plan for now and the longer term. Most of Scotland's radioactive wastes are from nuclear power generation.

On March 12, SCCORS convened a meeting of local government representatives at CoSLA HQ in Edinburgh to consider the Scottish Government's Consultation Documents together with an initial report commissioned by SCCORS from an independent Consultant on radioactivity in the environment. The meeting took the view that a number of technical matters remained unclear in the Consultation Documents. Therefore SCCORS sought clarification of these issues from the Scottish Government. SCCORS has now received replies from the Scottish Government and the Nuclear Decommissioning Authority. Although these technical replies were helpful in some instances, a number of larger issues remain outstanding. This makes it difficult for SCCORS and its advisors to furnish informed advice on the contents of the Scottish Government's Consultation Documents to local authorities.

Therefore the main SCCORS recommendation is that the Scottish Government should clarify a number of outstanding matters (see Summary below) and should extend the Consultation accordingly to allow for replies to the clarifications. In particular, SCCORS recommends that Scottish Councils should reserve their opinions on the proposal to add disposal to the existing waste policy of storage until more scientific information on the validity of near surface disposal is made available.

At a very late stage in the Scottish Consultation, the European Commission announced (ENDS, 2010) that it was launching a consultation on two proposals for binding EU legislation on the treatment of nuclear waste. The Commission stated it would be tabling legislative proposals on this matter by the end of 2010. The first proposal would be to strengthen EU law in internationally accepted principles and requirements laid down in the IAEA Safety Standards and the IAEA Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Under this proposal, Member States would be required to adopt national radwaste programmes. Consultees are asked to give their views on possible requirements for such national programmes, including the creation of a Regulatory Authority and an Organisation dedicated to radioactive waste management.

A second additional proposal would be to adopt specific EU requirements for the scope, content and review of these national programmes. For example, the Commission is seeking views on whether such programmes should include inventories of radioactive waste and spent fuel and should identify disposal routes.

Although these proposed changes apply to Member States (ie the UK), it is clear that any revision of Scottish policies on radioactive waste would need to adhere closely to the EC's proposed new legislation. The need to consider the EC's new proposals is a second reason for extending the Scottish Consultation.

The original deadline for responses to the existing Consultation Documents was April 9, but it is understood this has been changed to **Friday, April 30 2010.** Therefore SCCORS recommends that local councils should reply to the Scottish Government Consultation stating that additional information, as listed in the Summary below, is required, and that the Consultation should be extended to allow full consideration of the new EC proposals on radioactive waste policies.

In the SCCORS Commentary below, **the matters on which more information is necessary are discussed in bold.**

On 15 January 2010, the Scottish Government's Waste and Pollution Reduction Division published three documents on a proposed policy for Scotland's higher activity radioactive waste. The Consultation consists of three documents:

(1) The Consultation Document 2010 (CD)
http://www.scotland.gov.uk/Resource/Doc/298914/0093253.pdf
(2) Environmental Report 2010 (ER)
http://www.scotland.gov.uk/Resource/Doc/298929/0093254.pdf
(3) Supplementary Information 2010 (SI)
http://www.scotland.gov.uk/Resource/Doc/298942/0093255.pdf

Consultees are asked to consider all three documents in preparing their responses. Collectively, the documents set out a proposed policy statement on higher activity radioactive waste. The purposes of the proposed policy are:

- to enable waste owners and producers to plan for the management of their higher activity radioactive waste now and in the longer term; and
- to provide the policy framework to enable regulators to regulate the management of the waste.

Briefly, the proposed policy is to support long-term, near surface, near site storage and disposal facilities so that the waste is monitorable and retrievable and the need for transporting it over long distances is minimal. (CD para 6.02.01)

Proposed Change to Existing Policy

The Scottish Government's existing 2007 policy on nuclear waste management is set out in Appendix A of the Consultation Document (CD page 75). It states, inter alia, that Ministers

"…support the CoRWM recommendations for a robust programme of interim storage and would also support further joint research on other long-term management options. However, we do not accept that it is right to seek to bury nuclear waste, which will remain radioactive for thousands of years, in underground sites. This out of sight, out of mind policy should not extend to Scotland."

The proposed change from supporting storage to supporting storage and disposal is a policy shift in which political considerations are likely to be involved. These matters are not mentioned in the Consultation Documents. For example, there is no Ministerial preface – a common practice in consultations - which sets out Ministerial thinking on the matter. Presumably, Scottish Ministers permitted the present Consultation to take place, but this is unstated.

The Consultation Document (CD para 3.02.02) states the reason for the proposed change was that discussions with stakeholders had

"identified potential opportunities to treat the Waste and the possibility of disposing of some of it now in near surface, near site facilities."

This explanation is unclear; it may well be the case that "potential opportunities" exist, but they are not discussed. This is a serious matter as a change of Scottish Ministerial policy is being proposed here and it is important to ensure that the new policy has a sound scientific foundation. Unfortunately, in some past instances, nuclear policies have been decided on thin grounds and have later turned out to be ill-advised. It is necessary to ensure this does not recur with nuclear waste policy. **Scientific information on "potential opportunities" is required so that informed comments can be made on them.**

Also the above explanation does not appear to concur with some facts. For example, British Energy has a corporate policy not to dispose of waste at its sites and almost all ILW wastes at Dounreay are unsuitable for shallow disposal. **Further discussion and explanation is required on these points.**

Storage and Disposal

The Consultation Document (para 3.03.19) defines storage as placing waste in a suitable facility *with* the intent to retrieve it later. Disposal is defined as the emplacement of waste in a disposal facility *without* the intent to retrieve it later. In other words, the distinction is one of intent. **This is unsatisfactory as site operators' intentions can change in future: it would be preferable if there were substantive norms to be observed by each type of facility, eg degree of institutional control, existence of monitoring.**

The Environment Report (para 4.06**)** further explains that "*the concept of retrievability is built into the Policy as a requirement",* ie for both storage and disposal. Disposal facilities may be approved in situations where, although there is no intention to do so, retrieval may be possible. Unfortunately the Environment Report also states "…*this could mean that disposal facilities can… be backfilled and sealed*" and it is for the regulators to decide when a disposal facility is capable of closure. Therefore retrievability seems to be a rather elastic concept, stretching to mean whatever the site operator or regulator wants it to mean.

In other words, **the Consultation Documents' distinctions between disposal and storage remain unclear and need to be redefined**. In practice, retrievability may not actually be a helpful criterion. In underground repositories of whatever depth, the generation and emission of gases and the degradation of waste packages by oxidative/reductive processes may render wastes unable to be retrieved. For example, the former Nirex (2005, 2006) identified the need to carry out more research on the potential for exposures due to the production and release of methane gas from graphite wastes. Also, in a report for the European Commission's project on the 'Performance Assessment Methodologies in Application' to guide the development of the safety Case (PAMINA), the NDA (2008) drew attention to the uncertainties involved in gas emissions modelling. Gaseous emissions could profitably be discussed in the Consultation Document.

This means that each waste form has to be carefully analysed and decisions made as to whether it is safe enough to be disposed (ie no further institutional control) or whether it needs to be stored for longer periods (ie remain under institutional control).

It is understood that proposed disposal facilities would require a safety case to be drawn up and approved by both main regulators SEPA and the NII. Proposed storage facilities on the other hand would only require approval by the NII. This is unfortunate as **SEPA should be involved in examining the safety cases for storage facilities,** as these facilities will entail nuclide discharges and emissions. Just as important, no provisions exist for public consultation under the Nuclear Installations Act 1965 unlike the situation which would exist if waste storage were regulated under the Radioactive Substances Act 1993.

Designation of long-lived ILW wastes for disposal

The Near Surface Disposal Facilities on Land for Solid Radioactive Waste – Guidance on Requirements for Authorisation (GRA) produced jointly by SEPA, the EA and the Northern Ireland Environment and Heritage Service (SEPA 2009) provides guidance on the approach to regulation of near surface disposal facilities. It currently states (para 3.4.1 page 8)

"We do not envisage that near-surface facilities would be suitable for the disposal of high level waste (HLW), spent nuclear fuel or nuclear materials such as plutonium."

However when SEPA (2008) consulted on the **draft** Near Surface GRA, the draft added "*We do not envisage that near surface facilities would be suitable for disposing of long-lived ILW* ....."

In other words, initially there was no intention to include long-lived ILW. However in response to the consultation, BAe Systems and Energy Solutions (a company formed in 2006 by the merger of the former BNFL Inc with several US companies - specialists in near surface disposal in the US[1]) stated that an acceptable environmental safety case for "less toxic" ILW in a near-surface facility was possible and the GRA should include this type of waste. The guidance was therefore revised to indicate that "less radiotoxic" ie long-lived, intermediate level waste could be suitable for near-surface facilities, provided an acceptable environmental safety case could be made (page 15). However the scientific evidence and reasoning behind this change were not discussed.

Therefore **the evidence and reasoning behind the change to include long-lived ILW in near surface disposal facilities should be presented.**

Need for waste activities to be presented

The wastes addressed here are "higher activity" which means, in practice, Intermediate Level Waste (ILW). This is non-heat generating waste with activities greater than Low Level Waste (LLW) ie greater than 12 GBq of beta/gamma activity per tonne of waste and 4 GBq/tonne of alpha activity. **Unfortunately, the Consultation documents contain no references to specific activities of waste or to constituent radionuclide concentrations. These omissions will need to be rectified before informed replies can be made to the Consultation.**

Graphite wastes – not short-lived

A distinction discussed by the Consultation documents is between "long-lived" (LL) and "short-lived" (SL) intermediate level wastes. LL wastes contain nuclides whose half-lives are >30 years and SL wastes contain nuclides whose half-lives are <30 years. LL-ILW (22,971 m^3) consists mainly of irradiated core graphite (49%), activated metals (16%) and contaminated metals (5.4%). SL-ILW (4,637 m^3) consists mainly of sleeve graphite (58%), Magnox fuel debris (13%) and desiccant (10%).

Recently the proportion of LL wastes was reduced to 83% of Scottish ILW inventory. This was done mainly by re-classifying sleeve graphite as short-lived, but the rationale for this reclassification is unclear. Although less radioactive than moderator graphite, sleeve graphite will have been irradiated and neutron activation of N, C and O atoms will have occurred. Undoubtedly it will contain raised levels of C-14 which has a long half-life. **Therefore the Consultation Document should be changed so that all graphite is classified as long-lived.** This issue was clarified in later NDA responses which agreed that all graphite wastes were in fact long-lived.

Radioactive Graphite

The principal long-lived waste is graphite which contains C-14 with a half-life of 5,730 years. As shown in the data in table 1 (which uses waste activities from Hunterston B as an illustrative example), carbon-14 is the source of 98% or more of graphite's radioactivity. C-14 mainly results from neutron activation of stable C-13 (1% of naturally occurring carbon) and of the impurity N-14. The other nuclides result from neutron activation of other impurities in the original graphite.

[1] http://www.spinprofiles.org/index.php/Energy_Solutions

Table 1 Hunterston B: Waste Stream 4B313 – Decommissioning Wastes - Graphite ILW (only main nuclides are listed)

Nuclide	Half life - years	Principal Decay Mode	Activity MBq/m^3	%
H 3	12.3	β	560	-
C 14	5,730	β	203,000	98
Cl 36	301,000	β	1,800	0.9
Ca 41	103,000	β	76	-
Co 60	5.3	β γ	0.57	-
Ni 59	76,000	β	26	-
Ni 63	100	β	2,300	1.1
Nb 94	20,300	β	0.25	-
Ag 108m	418	β	2.5	-
Sn 121m	55	β	0.1	-
Tc 99	211,000	β	5.2	-
Total beta/gamma	**-**		**208,000**	**100**

data source http://www.nda.gov.uk/ukinventory/documents/index.cfm

Clearly, radioactive graphite is a major issue: its quantities are very large and its longevity extends over millennia. Graphite also presents other problems including the possible sudden release of stored Wigner (heat) energy and the evolution of gases (mainly CO_2, CH_4) during storage/disposal**. The Consultation documents could usefully give more consideration to the problems of dealing with graphite.** CoRWM's view is that graphite wastes should not be disposed of in a surface or near surface facility. After extensive enquiry consultation and review of evidence, CoRWM (2006) recommended that the best way to safely manage HAW in the long term was in a geological disposal facility at significant depth rather than a near surface facility.

On the basis of the information presented in the Consultation, it is difficult to recommend whether graphite should be consigned to a deep repository (ie to be treated as equally dangerous as spent fuel and other HLW) or whether it can be safely consigned to a surface disposal facility**. SCCORS reserves its position on the important matter of how to best to manage graphite wastes until further information is provided.** The views of SEPA should be canvassed on this matter.

Clearly, more research is required on graphite waste. It is reassuring that graphite R&D is currently being carried out by the European Commission under its 4-year Carbowaste programme. In addition, the NDA is considering UK strategy development for graphite, with support from Magnox SLCs and EdF involvement, and the IAEA is also establishing a Co-ordinated Research Project on graphite. Future policies on graphite waste management should await the completion of these studies.

What is near-surface?

The definition of near surface is indeterminate: it extends to above ground or below ground structures down to depths of "several tens of metres". This is unsatisfactory as it could extend down to 50 or even 60 metres or more, which is not what most people think of as "near" the surface. **SCCORS therefore recommends that the definition should be amended to state "less than 15 metres (ie 50 feet)".** The Consultation should contain detailed descriptions (and operating experiences) of a range of such facilities: in particular, the new LLW disposal facilities at Dounreay and the El Cabrera facilities. This would allow the advantages and disadvantages of such options to be assessed.

Is near surface disposal "safe"?

In recent years, various reports (especially in the US) have indicated that major uncertainties exist in the modelling of the possible health impacts of disposed nuclear waste. It is likely that a safety case for near surface disposal may have fewer uncertainties than those associated with deep geological disposal, but there will always be concern that if mistakes have been made in environmental computer models, then radiation doses to the public living nearby may be higher than anticipated, but little remedial action may be available.

Even if the environmental transport computer models predict correctly, there is no 'safe' dose of radiation, and estimates of radiation doses/risks usually contain unquantified uncertainties. The methodology used in estimating doses to individuals is quite complicated, and is derived using at least three other computer models in sequence. The cumulative uncertainty in dose and risk estimates could be large as was recognised by the UK Government's CERRIE (2004) report.

The Consultation Documents do not acknowledge these uncertainties. For example, the Environment Report (paras 3.14 and 3.15) implies that radioactive discharges to the environment are of little concern provided they are regulated and remain within authorized limits. This fails to recognise the uncertainties involved in estimating doses from inhaled and ingested radionuclides and their consequent health effects. It also fails to recognise, for example, the KiKK report (Spix 2008; Kaatsch et al 2008 and discussed by Fairlie 2008, Nussbaum 2009). This report, commissioned by the German Government, observed large increases in childhood cancers among children near nuclear facilities. Nor does it acknowledge the paradigm shift currently going on amongst radiation biologists on the unusual non-targeted effects of radiation recently discovered.

Lastly, the Environment Report (para 3.13) compares radiation doses from man-made sources with doses from natural radiation and medical sources. Such comparisons are irrelevant and inappropriate. It invites the inference that natural background radiation is safe, but this is not the case (Edwards 1996). In the UK, background radiation is estimated to cause, on average, about 6,000 to 7,000 future cancer deaths per year. There is also an important ethical difference: one is natural but the other is man-made and subject to social decisions. With medical sources, these have a direct benefit to the exposed individual: this will not apply to future generations who may be exposed to radiation from wastes created in the past.

Export of waste for treatment

The proposal in the Consultation Document (para 4.03.03) to allow consideration to be given to the transport of wastes abroad for treatment (and the return of concentrated wastes) should be re-examined. This proposal conflicts with the stated aim of the Policy to minimise the transport of wastes over long distances (para 6.02.01).

Waste Volumes

Table 2 sets out the volumes of the main ILW waste forms in Scotland as of 2007.

Table 2 (main waste forms - m^3)

	EdF (formerly BE)	MOD	DSRL	Magnox	Stored Volume (m^3)	Packaged Volume (m^3)		
	Hunterston B	Torness	Vulcan, Rosyth	Dounreay	Chapel cross	Hunter ston A		
Graphite–LL	1882	2191	0	194	3647	3434	11348	17261
Graphite–SL*	467	654	0	7	23	1507	2657	4042
Activated Metals	671	374	124	1205	888	332	3593	7112
Contamin. Metals	786	672	0	1385	195	16	3053	6383
Raffinates	0	0	0	2749	0	0	2749	3792
Totals	**4181**	**4057**	**148**	**7909**	**4879**	**6434**	**27608**	**46577**

* NB this report queries the validity of the category of "short-lived" graphite. See above

The total volume is ~47,000 m^3, the equivalent of about 500 double-decker buses. Another way of visualising this is that it is ten times the volume of waste which can be stored in the very large Hunterston A ILW store– see photograph on page 35 of the Consultation document - is 4,800 m^3 (Enviros 2006).

Therefore an additional nine facilities of the same size as the very large Hunterston A ILW store will be required to manage the ILW in Scotland as of 2007. The Consultation should discuss where these nine new large facilities are likely to be located.

Applicable principles

The Consultation refers to two main Principles as "underpinning" its aims

- the level of protection provided to people and the environment against radiological and any other hazards of the Waste both at the time of storage or disposal and in the future is consistent with the standards in place at the time; and
- developers and operators of facilities will engage with stakeholders throughout the process of managing the Waste.

These are welcome but the Consultation Documents do not discuss the IAEA's Principles of Radioactive Waste Management (IAEA 1995) or the HSE's more detailed radioactive waste principles contained in its Safety Assessment Principles for Nuclear Facilities (HSE 2006). Both are pertinent and are set out in Appendix B. It would be useful for the Consultation Documents to discuss the IAEA and HSE Principles, and in particular the guidance on HSE's first principle re a strategy for managing radioactive waste. This contains 20 points for guidance on waste strategy and these are also set out in Appendix B. Of these points, the following are considered particularly relevant to the Consultation.

Radwaste strategy should:

b) … **demonstrate that the radiological hazards posed by historic wastes are reduced progressively;**
c) include a description of the **dutyholder's policy and objectives** for the management of radioactive waste;
e) cover the **current and future inventory of radioactive waste**, including waste arising from proposed new facilities;
f) encompass the **anticipated timescales for the management of radioactive wastes**, from production to disposal (where appropriate), including intermediate management steps;
t) **describe the significant assumptions, uncertainties and project risks** associated with the achievement of the strategy, and how these will be managed.

Conclusions (also see answers to questions in Appendix A)

The Consultation issued by the Scottish Government's Waste and Pollution Reduction Division is proposing to change the Scottish Government's current policy on the long term management of nuclear waste to include disposal as well as storage in the management ILW radioactive wastes.

The Consultation documents remain unclear on the following

- the rationale for the proposed policy change, ie the scientific information and research justifying this change and permitting confidence in the disposal of nuclear waste
- the definitions of disposal and storage
- the definition of near surface
- information on the radioactivity concentrations and radionuclide compositions of waste forms

As a result, it is difficult to make informed judgments on the Consultation's proposed policy. **It is recommended that Councils should reserve their opinions on the proposal to add disposal to the existing waste policy of storage until more scientific information on the validity of disposal is made available.**

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SCCORS Answers to Consultation Questions

The Consultation does not ask whether consultees agree with the proposal to include disposal as well as storage in the proposed Policy on HAW wastes. **It is recommended that Councils should reply indicating that they defer their decision on this matter until further information (see Summary on page 1) is provided by the Scottish Government's Waste and Pollution Reduction Division.**

Question 1. *Have we explained what waste we have in Scotland and how it is managed?*
Answer 1. Clearly much effort and preliminary discussion has gone into producing the consultation and into policy development. This is acknowledged, however the documents could be usefully expanded in a number of areas. For example, the information on waste volumes is useful but information on nuclide contents and radioactivity concentrations in waste at each nuclear industry site is also needed. Also it would be useful to know the proportions of conditioned and unconditioned wastes. The draft Policy could also identify which materials are suitable/unsuitable for proposed near surface and which should be stored along with supporting evidence on waste form stability. For example, the draft Policy should clarify that 98% of Dounreay ILW is not suitable for near-surface disposal.

Question2. *Have we explained why we need to define the terms used in the Policy?*
Answer 2. In most cases yes, but more information could be provided on the reasons for introducing disposal was to the proposed policy, as it was excluded from the original 2007 Ministerial statement. Also it would be helpful to see technical and scientific evidence on near-surface ILW disposal including the experiences of other countries in this regard.

Question 3. *Do you agree with the definition of long-term?*
Answer 3. The definitions of long-term are up to 100 years for the design life of structures, and up to 300 years for institutional control of a disposal facility. However para 4.6.6 of the GRA for near-surface disposal facilities (SEPA 2009) states "it is …unreasonable to rely on people to take action for more than a few hundred years at most to control risks from a disposal facility ... It is not likely that we would accept an environmental safety case… for longer …." It is unclear whether 300 years would meet the "a few hundred years at most" criterion.

Question 4. *Do you agree with the definition of near surface?*
Answer 4. The definition of near surface is indeterminate: it extends to above ground or below ground structures down to depths of "several tens of metres". This is unclear and unsatisfactory: it should be qualified to state "but less than 30 metres". The Consultation should contain descriptions of a range of such facilities and more fully discuss the new LLW Disposal Facilities at Dounreay and the Hunterston ILW store. This would allow the advantages and disadvantages of such options to be assessed.

Question 6. *Do you agree with the definition of storage?*
Answer 6. The definition is consistent with the regulatory use of the word at present. However the term "storage" should be divided into long-term and short-term. Long-term stores should have a design life of ~300 years, and should require rigorous safety cases to be approved by NII and SEPA to protect people and the environment in the remote case that wastes were not removed from the store and declared to be "disposed" after 300 years. A short-term store would have a life of ~100 years and its waste would be retrieved before then. This would not require the equivalent of a disposal safety case.

Question 7. *Do you agree with the definition of disposal?*
Answer 7. Again the definition is broadly consistent with the regulatory use of the word at present. But that is not the main point. The main question is whether consultees agree with the proposal to change to a storage plus disposal policy. See above.

Question 8. *Do you agree with the definition of monitorable?*
Answer 8. Monitoring arrangements are not discussed in detail in the Consultation documents. The different monitoring requirements for stored waste and disposed waste need to be described.

Question 9. *Do you agree with definition of retrievable?*
Answer 9. No. The Environment Report (para 4.06) explains that "the concept of retrievability is built into the Policy as a requirement", ie for both storage and disposal. Disposal facilities may be approved in situations where, although there is no intention to do so, retrieval may be possible. Unfortunately the Environment Report adds "…this could mean that disposal facilities can… be backfilled and sealed" and it is for the regulators to decide when a disposal facility is capable of closure. Therefore retrievability seems to be an elastic concept, stretching to mean whatever the site operator or regulator wants it to mean. It would be preferable if there were substantive norms to be observed by each type of facility, eg degree of institutional control, existence of monitoring.

Question 12. *Have we explained the implications of the Policy?*
Answer 12. Not for all aspects. For example, the financial, social and environmental implications of storing ILW remain unclear.

Question 17. *Do you agree that the Nuclear Decommissioning Authority should be responsible for developing the Strategy to implement the Policy?*
Answer 17. But what about the Scottish plants of EdF?

Question 20. *Does the Proposed Detailed Statement of Policy include all relevant issues?*
Answer 20. No. Three matters in particular need more consideration.

a. Stakeholder engagement The Consultation recognises the need for public and in developing policy. The Consultation Document states (para 5.01.04) that the Scottish Government expects developers and operators to engage with "local communities and the relevant regulatory and authorities to ensure their views are taken into account when plans for storage or disposal facilities are being developed". However the responsibilities of Scottish Ministers and the Waste and Pollution Reduction Division of the Scottish civil service in public and stakeholder engagement in future steps are not well defined.

b**. Research and Development** The Consultation document contains few references to R&D (eg at 4.05.03). This is stated to be the responsibility of waste owners, producers, and facility operators. More R&D on near-surface disposal of HAW is clearly needed.

c. Costs The Consultation documents only briefly refer to financial planning and financial costs. Some financial modelling would be useful to understand the costs and benefits to the public purse for a range of the possible scenarios that the policy could result in. For example a comparison could be made of the costs and benefits for establishing individual facilities at each of Scotland's main civil nuclear sites against the option of sharing a facility between several nuclear site licensees. This may show that costs can be reduced, but that transportation risk is increased.

Appendix: Principles and Guidance on Radioactive Waste Management

1. IAEA Principles of Radioactive Waste Management (IAEA 1995)
   Principle 1: Radioactive waste shall be managed in such a way as to secure an acceptable level of protection for human health.
   Principle 2: Radioactive waste shall be managed in such a way as to provide an acceptable level of protection of the environment.
   Principle 3: Radioactive waste shall be managed in such a way as to assure that possible effects on human health and the environment beyond national borders will be taken into account.
   Principle 4: Radioactive waste shall be managed in such a way that predicted impacts on the health of future generations will not be greater than relevant levels of impact that are acceptable today.
   Principle 5: Radioactive waste shall be managed in such a way that will not impose undue burdens on future generations.
   Principle 6: Radioactive waste shall be managed within an appropriate national legal framework including clear allocation of responsibilities and provision for independent regulatory functions.
   Principle 7: Generation of radioactive waste shall be kept to the minimum practicable.
   Principle 8: Interdependencies among all steps in radioactive waste generation and management shall be appropriately taken into account.
   Principle 9: The safety of facilities for radioactive waste management shall be appropriately assured during their lifetime.

2. HSE Safety Assessment Principles for Nuclear Facilities (HSE 2006)
   Principle RW1. A strategy should be produced and implemented for the management of radioactive waste on a site.
   Principle RW2. The generation of radioactive waste should be prevented or, where this is not reasonably practicable, minimised in terms of quantity and activity.
   Principle RW3. The accumulation of radioactive waste on site should be minimised.
   Principle RW4. Radioactive waste should be characterised and segregated to facilitate subsequent safe and effective management.
   Principle RW5. Radioactive waste should be stored in accordance with good engineering practice and in a passively safe condition.
   Principle RW6. Radioactive waste should be processed into a passively safe state as soon as is reasonably practicable.
   Principle RW7. Information that might be required now and in the future for the safe management of radioactive waste should be recorded and preserved.

3. Under Principle RW1, the HSE gives the following guidance (see para 651)
   Radioactive waste strategy should:

a) be consistent with Government policy, including the Government's overall policy aims on sustainable development;
b) be integrated with the decommissioning strategy and other relevant strategies, and should demonstrate that the radiological hazards posed by historic wastes are reduced progressively;
c) include a description of the dutyholder's policy and objectives for the management of radioactive waste;
d) ensure that the generation of radioactive waste is prevented or minimised;
e) cover the current and future inventory of radioactive waste, including waste arising from proposed new facilities;
f) encompass the anticipated timescales for the management of radioactive wastes, from production to disposal (where appropriate), including intermediate management steps;
g) consider a full range of options during its development. The optioneering process should take account of relevant factors, which may include those listed in Principle RW.6 concerned with timing;
h) describe, or refer to, the different options that were considered during its development and the case for the chosen option(s);
i) contain, or refer to, the plan for the management of each radioactive waste stream from generation to the final management step, including nuclear matter that may be categorised as waste in the future;
j) identify the optimum waste management route;
k) take account of off-site and on-site interdependencies, eg between waste processing facilities;
l) ensure that radioactive waste is managed in a manner that minimises the need for future processing;
m) ensure that the generation of radioactive waste of a type or form incompatible with currently available storage or disposal technology is prevented or minimised;
n) ensure that waste that cannot be managed using current techniques, or techniques under current development, is not created;

o) take account of biological, chemical and other hazards that may influence the management of radioactive waste;
p) ensure that the adequacy of the storage capacity is reviewed at appropriate intervals taking account of current and future arisings, the expected life of existing stores, and planned additional stores;
q) be compatible with the requirements of authorisations granted by the environment agencies;
r) be compatible with facility safety cases;
s) include an outline of the safety management system and the general approach to ensure that radioactive waste will continue to be managed safely;
t) describe the significant assumptions, uncertainties and project risks associated with the achievement of the strategy, and how these will be managed ends