

The Highland Council

Planning, Environment and Development Committee

16 March 2011

Agenda Item	
Report No	

UK and Scottish Government Consultation – Dounreay Radioactive Waste Substitution

Report by Director of Planning and Development

Summary

The Scottish and UK Governments are consulting on a proposed policy of radioactive waste substitution for the radioactive waste arising from historic fuel reprocessing contracts with overseas customers at Dounreay.

Members are asked to note the key issues highlighted in the report and agree to the response to the questions as set out within the Appendix 3.

The report links to the Council's corporate objectives on the Environment; specifically to support the above ground storage of intermediate level waste from Dounreay until a Scottish waste strategy is agreed and implemented.

1. Background

- 1.1 Dounreay was the UK's research and development establishment for nuclear fast reactor technology for nearly 50 years. There were three reactors: the Materials Test Reactor (MTR), the Dounreay Fast Reactor (DFR) and the Prototype Fast Reactor (PFR). These reactors operated at different periods, spanning from 1958 until 1994.
- 1.2 From the mid 1950's through to 2008, the United Kingdom Atomic Energy Authority (UKAEA) was the UK Government non-departmental public body responsible for operating Dounreay. UKAEA entered into a number of commercial contracts with overseas research reactor facilities to reprocess their fuels through the MTR and PFR reprocessing plants at Dounreay. The quantities of overseas fuel delivered were approximately two tonnes.
- 1.3 In April 2008 ownership of Dounreay transferred to the Nuclear Decommissioning Authority (NDA). With it came responsibility for the UKAEA's commercial contracts with overseas customers.
- 1.4 The contracts entered into by UKAEA contained clauses allowing for the radioactive waste allocated to overseas customers under the reprocessing contracts to be returned to the country of origin, the so called "Return of Waste Clauses". Government intends that these clauses be enacted and the

radioactive waste sent back to the countries of origin as soon as possible. However, to enact these clauses, the NDA is contractually obliged to return the radioactive waste in a form which can be safely transported and stored in accordance with such regulations as may be specified by the relevant competent national authorities.

- 1.5 To assist the NDA with its decisions on nuclear waste management at Dounreay, it is the Government's intention to produce a policy for radioactive waste substitution. In December 2010 the Government published its consultation document 'Dounreay Radioactive Waste Substitution.' The consultation is seeking the Council's views on the policy. It does so by posing 5 questions. The consultation, the full details of which can be viewed at <http://www.scotland.gov.uk/Dounreay-Waste>, closed on **11 March 2011**. However, the Highland Council has agreed an extension with Scottish Government until **21 March 2011**.

2. Waste substitution

- 2.1 There is existing UK Government policy covering waste substitution. Indeed the principle of waste substitution is already established in the UK nuclear industry i.e. British Nuclear Fuels (BNFL) at Sellafield. Current policy does not however cover the substitution of any radioactive waste at Dounreay.
- 2.2 In simple terms, for the purposes of this consultation, waste substitution means that instead of sending customers the radioactive waste allocated to them under their reprocessing contracts, an equivalent amount of radioactive waste from another source within the NDA's estate would be sent. That is to say the waste would be of radiological equivalent.
- 2.3 Specifically, the NDA has sought approval for the substitution of:
- Prototype Fast Reactor (PFR) and Cemented Materials Test Reactor (MTR) raffinate wastes from Dounreay with vitrified radioactive wastes from Sellafield and,
 - Prototype Fast Reactor raffinate waste at Dounreay with Cemented Materials Test Reactor raffinate waste at Dounreay
- 2.4 The proposed Government Policy is set out within Appendix 1. A summary of the radioactive waste involved is given in Appendix 2.

3. The perceived benefits of waste substitution

- 3.1 Since many customer states are already embracing vitrified waste technology, i.e. encapsulation of waste in solid glass, it is likely that a significant percentage of returned waste will be in this form. Dounreay currently does not have a facility to carry out this process. If one were to be built it would cost several hundreds of million pounds. In addition a further facility may have to be constructed at Dounreay to allow export of the vitrified radioactive waste directly to sea transport. Alternatively, all vitrified radioactive waste produced at Dounreay would have to be transported overland to the existing Residue

Export Facility in West Cumbria.

- 3.2 Sellafield already has arrangements in place for transporting vitrified radioactive wastes to overseas customers. Subject to appropriate commercial terms, it may be possible to incorporate the radioactive waste return obligations from Dounreay within these arrangements. This would result in a substantial saving for the NDA. Where the return of vitrified radioactive waste from Sellafield is not acceptable to customers, enabling a single type of cemented radioactive waste to be returned to these customers is considered to simplify arrangements.
- 3.3 There is no cementation plant for PFR reprocessing radioactive waste at Dounreay. Given current financial constraints one is unlikely to be available for several years. This is in contrast to the cementation plant for MTR reprocessing radioactive waste, which is expected to finish immobilising all of the MTR reprocessing radioactive waste by the end of 2013. Limited arrangements are in place for the return of MTR radioactive wastes from Dounreay.
- 3.4 The ability to return vitrified radioactive waste from Sellafield in place of radioactive waste from Dounreay and/or returning cemented MTR radioactive waste in the place of PFR radioactive waste is felt to make best use of the facilities that already exist. It might also result in radioactive waste being returned overseas sooner.
- 3.5 This option should assist further in reaching agreement with customers on the type of radioactive waste to be repatriated. This is expected to clarify management arrangements required for decommissioning operations at Dounreay, minimise delays in reaching the Interim End State (2026) and reduce overall expenditure.
- 3.6 In summary, the perceived benefits of a radioactive waste substitution policy for Dounreay are:
- The ability to return radioactive wastes earlier, in a form that customers can accept;
 - Clarity for Dounreay's future radioactive waste management needs;
 - Simplification of transport of radioactive waste overseas;
 - Completion of contracts;
 - Avoiding the need to construct another vitrification plant.

4. Implications of waste substitution for Dounreay

- 4.1 While the final impact on the amount of overseas radioactive waste at Dounreay will not become known until the NDA has concluded its agreements with its overseas customers the consultation document does give an indication of the likely implications of the proposed Policy on storage at Dounreay as well as radioactive waste transportation.

Storage at Dounreay

- 4.2 The amount of cemented radioactive waste arising from reprocessing overseas fuel at Dounreay is very small in relation to the overall amount of cemented radioactive waste that will be stored at the site arising from its own activities. Were all Dounreay's customers to substitute cemented MTR radioactive waste drums then there would be an overall reduction in the number of drums remaining on the site (around 1%). In the worst case, where all customers received substituted vitrified radioactive waste, approximately 3% of the total drum inventory at Dounreay would remain in the UK.
- 4.3 Dounreay's ILW storage facilities are designed to hold 12,000 drums of radioactive waste. It is expected that any increase in stored drums through radioactive waste substitution can be accommodated within the existing arrangements.

Transportation

- 4.4 If vitrified radioactive waste from Sellafield is substituted for cemented radioactive waste at Dounreay, fewer shipments of radioactive waste would be required from the UK. This is because the waste is much more concentrated than either PFR or MTR waste.
- 4.5 If MTR cemented radioactive waste is substituted for PFR radioactive waste, more shipments may potentially be required because there would be more drums being returned i.e. the waste is less concentrated. The consultation document considers that it may however be possible that the additional number of drums could be returned in the same number of shipments.
- 4.6 The consultation document stresses that any shipments will be carried out in full compliance with international laws and regulations and that any storage at Dounreay would be managed in line with Scottish Government policy on radioactive waste.

5. Conclusions

- 5.1 The proposed Policy would allow the NDA to return an equivalent amount of radioactive waste from elsewhere within its estate. This would avoid delays and significant costs that would result from constructing dedicated new plant to process what are very small amounts of radioactive waste stored at Dounreay. As expected by Government the overseas contracts could be concluded earlier, the NDA and Dounreay would have greater clarity in respect of waste management planning and there would be potential savings to the UK taxpayer.
- 5.2 The precise impacts on transportation and storage at Dounreay won't be determined until final arrangements are made between the NDA and its overseas customers. However, in the event that PFR/MTR waste was substituted with vitrified waste from Sellafield the storage of that waste would be able to be accommodated at Dounreay under current working assumptions.

5.3 While fewer shipments of waste from Dounreay would result if substitution is adopted, an increase in transportation may result if PFR waste is substituted by MTR waste. The implications are however likely to sit somewhere in-between should the proposed Policy be adopted. The substitution of radioactive waste that takes place under the proposed Policy would be done on the basis that it was broadly 'environmentally neutral' for the UK. It is likely also to be broadly neutral for Dounreay.

Recommendation

That Members note the key issues highlighted in the report and agree to the response to the questions as set out within the Appendix 3.

Signature:

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Date: 08 March 2011

Background Papers:

'Dounreay Radioactive Waste Substitution: Consultation 2010' – December 2010
The Scottish Government/Department of Energy and Climate Change

Appendix 1

Statement of Government Policy (proposed)

The aim of this policy statement is to set down the Government's position on the substitution of radioactive wastes at Dounreay arising from the reprocessing of overseas nuclear fuels, known as 'raffinate'.

Government policy remains that the radioactive wastes resulting from the reprocessing of overseas spent fuel at Dounreay under those reprocessing contracts signed since 1976 should be returned to the country of origin. This should be carried out as soon as practicable after the radioactive waste has been produced.

Government accepts that the circumstances at Dounreay have changed markedly since the United Kingdom Atomic Energy Authority entered into contracts with overseas customers to reprocess nuclear fuels. As a result alternative means of satisfying contractual obligations should now be considered in order to allow these obligations to be discharged as soon as reasonably practicable.

Substitution of Prototype Fast Reactor (PFR) and Cemented Materials Test Reactor (MTR) raffinate wastes from Dounreay with a radiologically equivalent amount of vitrified radioactive waste from Sellafield is permitted subject to contractual agreement with overseas customers and approval from the environmental regulators.

Substitution of Prototype Fast Reactor raffinate waste with a radiologically equivalent amount of cemented Materials Test Reactor raffinate is also permitted subject to contractual agreement with overseas customers and approval from the environmental regulator.

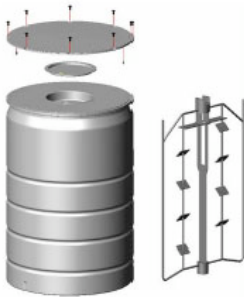
In both cases Government expects broad environmental neutrality to be maintained, primarily on the basis of radiological equivalence. Government will not specify the methodology used to determine radiological equivalence but expects the environmental regulators, the Environment Agency and the Scottish Environment Protection Agency to be satisfied that the arrangements between the NDA and its overseas customers meet this requirement.

Appendix 2

The Radioactive Waste

Raffinate is a radioactive waste which is removed as liquid during reprocessing of spent fuel. To return this raffinate to customers the liquid radioactive waste needs to be converted into a form that is suitable for transportation, storage and disposal. This process is called immobilisation. To achieve this immobilisation, Intermediate Level Waste (ILW) raffinate that has been produced from reprocessing fuel at Dounreay can be mixed with cement. Figure 1 shows a typical drum used to solidify liquid radioactive waste for transport and storage by mixing with cement.

Figure 1 - Diagram of a 500 Litre Stainless Steel Cementation Drum



Reprocessing of fuel at Sellafield has created raffinates that are more radioactive than the raffinates produced at Dounreay. These are classified as High Level Waste (HLW). Currently in the UK, HLW is immobilised by a process of vitrification. That is, the raffinate is mixed with molten glass and solidified. The only vitrification facility in the UK is located at Sellafield. Figure 2 shows a vitrification canister used at Sellafield.

Figure 2 - Sellafield Stainless Steel Vitrification Canister



Due to the nature of the fuels and the design of the different reactors, reprocessing MTR fuel generated ILW raffinates. Reprocessing of PFR fuel originally generated HLW raffinates. Radioactive waste at Dounreay that was previously classified as HLW was reclassified as ILW in the 2004 UK Radioactive Waste Inventory. This happened because it had decayed sufficiently so that it no longer generated enough heat to be classified as HLW.

Capability currently exists at Dounreay to produce transportable radioactive waste from the MTR liquid raffinate in the form of cemented drums. Plans to construct a cementation plant for radioactive waste generated by the PFR reprocessing plant are currently on hold and a plant is not expected to be ready until 2017 at the earliest.

Appendix 3

Question and Answers

Q1	Do you agree that a waste substitution policy should be adopted for radioactive waste arising from overseas research reactor fuel reprocessing contracts at Dounreay?
	Yes. The proposed Policy would provide the NDA and DSRL with flexibility as to how to best manage its waste inventory. The proposed Policy is likely to make best use of the existing infrastructure for waste management within the NDA estate providing better value for money to the taxpayer.
Q2	Do you agree that substituting cemented Materials Test Reactor radioactive waste for Prototype Fast Reactor radioactive waste should be an available option to finalise the overseas contracts?
	<p>Yes. If cemented material is to be accepted by overseas customers it would seem sensible to look at alternative arrangements within the existing Dounreay inventory as opposed to building new plant for the sake of small quantities of material at substantial cost. Again, this would achieve greater value for money for the taxpayer.</p> <p>While, in the event that all waste to be repatriated takes this form, it may result in the transportation of a greater number of drums than a PFR equivalent the financial cost of building facilities to vitrify PFR waste are considered to significantly outweigh this. In reality it is likely that a mix of vitrified and cemented forms of waste will be repatriated.</p>
Q3	Do you agree that substituting vitrified radioactive waste from Sellafield for cemented Materials Test Reactor radioactive waste and/or Prototype Fast Reactor radioactive waste should be an available option to finalise the overseas contracts?
	<p>Yes. Again this provides best value to the taxpayer. It would also enable the contracts to be concluded earlier than if a new facility were to be purpose built at Dounreay.</p> <p>While a higher proportion of waste originally destined for overseas is likely to remain at Dounreay under such a proposal, appropriate storage capacity is available within the site. Overall the waste subject to the proposed Policy would form a minor proportion of all ILW waste on site. Less transportation of materials from Dounreay would be required.</p>
Q4	Do you agree with the proposals to ensure broad environmental neutrality for the United Kingdom?
	Yes. As the waste to be returned may differ from that specified or expected when the contracts were originally entered into it would seem a pragmatic approach to adopt a policy of radiological equivalence.
Q5	Do you agree that all of the relevant implications of the proposed policy have been identified?
	Yes.