

**Summary of the Workshop on the Potential  
Application of Metal Melting in the UK Nuclear  
Sector held on the 6<sup>th</sup> October 2004**

**by**

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# 1 Introduction

Following the recommendation in [Buckley et al, 2004], a workshop was held on the 6<sup>th</sup> October 2004 at Birchwood Conference Centre in Warrington to discuss metal melting as a possible strategy for radioactive metallic waste. The workshop was organised on behalf of the Health and Safety Executive by NNC Ltd.

A number of speakers presented short, and sometimes challenging, presentations of 10 –15 minutes to focus and stimulate discussion in the later workshop sessions. Presentations were made giving the perspective from abroad, from waste owners and from regulators. Presentations also covered potential disposal aspects and stakeholder issues. The agenda for the workshop is contained in Appendix A.

Invitations to attend were sent to representatives of institutional stakeholders in the UK including all the nuclear operators, nuclear regulators in Great Britain, UK government departments and contractors and consultants working in the nuclear industry. Invitees were also encouraged to circulate the invitation to other interested parties. The final list of attendees is attached in Appendix B. Fifty-eight people attended the workshop representing views and opinions from a wide-range of organisations.

The objective of the workshop was to stimulate discussion and consider likely barriers to the implementation of metal melting as part of a radioactive waste management strategy and the benefits and advantages, if any, of seeking to address these constraining factors.

This report seeks to record the comments and remarks which were made in the course of the feedback sessions of the workshop, these in no way are to be relied upon as statements of the views of NNC Ltd, the HSE or the authors of this report.

## 2 Workshop Findings

### 2.1 Workshop 1

The first workshop session was held after presentations by representatives from Sweden and France where melting technology has been successfully applied to metals from the nuclear industry and also presentations from representatives from the UK nuclear sector on their perspective, experience and attitudes towards the application of melting to their metal wastes.

Participants split into groups to discuss what they had heard and to seek to answer the following question "What are the key issues?"

The key issues/comments from each group were fed back to the workshop. These have been grouped under the following headings:

#### 1. BPEO & Responsibility

- Rigorous life-cycle analysis of the potential environmental impacts and costs of melting is required before a decision on melting could be made.
- The technology is proven.

- Will it work?
  - What about the clean-up of gases?
  - Could be useful if targeted and used in the correct way.
  - Should maximise what can be achieved by dry cold processes first.
- Does it add value? Best Practical Environmental Option (BPEO)?
  - Cost?
  - Locally could it give a way forward on specific projects?
- What is its availability – would there be sufficient capacity to meet demand in the required timescales?
- Need to consider the overall environmental balance, consider all aspects including secondary wastes and economics of disposal.

## 2. Clearance Limits

- Why do other EU countries appear to have higher Clearance levels? Could the NDA take infraction proceedings against the UK government on this issue if there is not a level playing field? For Ni in the UK the general clearance/free release level is 0.4 Bq/g according to the Radioactive Substances Act (Substances of Low Activity) Exemption Order; EC recommendations in Radiation Protection 89 (European Commission, 1998) on specific clearance levels for metal scrap recycling suggests a figure 10 000 Bq/g for the Ni nuclides Ni-59 and Ni-63? (It should be noted that this level is based on the released metal being subsequently melted in a ratio of 1:10 with general 'normal' scrap).
- But could we be importing steel which under UK regulations would be LLW?
- Are the UK Regulatory limits too low?
- Clearance limits should be reviewed after it has been established how much suitable metal waste there is and what can be recycled into the general market, what can be recycled within the nuclear industry and what should be melted just to volume reduce prior to disposal.
- Proper investigation into the real difference between clearance/free release levels in the UK and other European Countries is required. (See Gerchikov et al, 2003)
- Clearance levels are generally being pushed down, not up.

## 3. Internal and External Markets

- Is there a market for the material:
  - How big is the market for the reuse of the material within the nuclear and other hazardous industries?
- If the material is re-used internally there are potentially too many different materials to be managed and tracked.
- Metal recycling internally is not a core skill of the nuclear industry.

- The melted metals could be used in shielding.
- A total volume of 500 000 tonnes of metals seems a large quantity but for the steel industry this is small.
- In order manage the flow of material, metals could be stored and treated in batches centrally in order achieve economy of scale.
- Should consider bonded storage, once melted metal ingots currently above clearance levels could be stored and allowed to decay (decay storage).

#### **4. Inventory – how much and when?**

- There is a need to identify the metals inventory more fully: what do we have and when will it be available? Then create a hierarchy of what can be recycled into the general market, what can be recycled within the nuclear industry and what should be melted just to volume reduce prior to disposal.
- The inventory needs to be in a form that can be used strategically.

#### **5. Public Attitudes**

- Would it be ethical to ship metals to other EU Member States for treatment? There are likely to be public risk perception problems and it is likely to be contentious which would jeopardize this approach.
- Who would take the facility? The not in my back yard (NIMBY) issue. CORUS would not be happy to have such a facility on their own sites.
- How will the end-users of the melted steel and the public respond?
- Steel industry is reluctant to accept metals from the nuclear industry.
- The public will not favour transport to central facilities.

#### **6. Policy**

- There is a role for the NDA in creating the environment to look at the issue of melting on a national level.
- A NDA policy or a directive to recycle would be required or perhaps a surcharge or incentive would be necessary to make it economically beneficial to recycle.
- What is the driver/purpose for melting: to reduce volumes for disposal, to recover valuable metal resources by recycling and reuse, or a combination?
- Is it a case of dual standards? Radiation Protection 89 (European Commission, 1998) is encouraging the blending of wastes.

- Batching of wastes is currently frowned upon.

## **7. Economics – true costs**

- It is cheaper to send the metals to Drigg.
- Current costs of disposal do not factor in the cost of replacing Drigg LLW repository.
- Current economics favour alternative techniques or disposal. If the unit cost of disposal was to change this could change e.g. the introduction of environmental premiums such as the landfill tax in the case of the disposal of waste to landfill sites.
- There could be social and environmental reasons to recycle metals as opposed to burying them.

## **8. LLW Repositories**

- Could it assist in managing Drigg as a resource and managing limited LLW disposal capacity?
- Melting both for volume reduction and for the purposes of recycling could be part of extending the life of Drigg.

## **9. Overall Responsibility & Joined Up Thinking**

- There is a need for leadership and a joined-up approach.
- There needs to be more interaction with the non-nuclear industry.
- The NDA doesn't own all the nuclear sites and there will potentially be different management companies so where will the integrated approach originate?
- There is a need for an integrated approach in order to achieve a quicker turnaround of authorisations.
- Central facilities should use a range of techniques, metal melting is not automatically the best solution.

### **2.2 Workshop 2**

After lunch there were a further four presentations in this case covering perceived stakeholder issues, a consideration of melting as a pre-treatment before disposal, and the perspectives of the Environment Agency and the Health & Safety Executive on the regulatory issues.

Having heard these views and remarks the participants once again broke into groups. On this occasion each group took up the challenge of providing the answer to one of the key issues identified in the earlier workshop session:

1. BPEO & Responsibility
  2. Clearance Limits
  3. Internal and External Markets
  4. Inventory – how much and when?
  5. Public Attitudes
  6. Policy
  7. Economics – true costs
  8. LLW Repositories
  9. Overall Responsibility & Joined Up Thinking
- The finding of the groups were as follows:

### **Who should take responsibility for the national BPEO?**

In the past carrying out BPEO's on a project-by-project basis has ruled melting out due to costs and scale. Producers cannot take responsibility for solutions on a UK basis and the NDA, although national could not cover Ministry of Defence sites. Therefore it was suggested that CoRWM should advise government departments who could then direct the NDA who would then feed this national approach to the site operators. The benefit of using CoRWM to investigate melting is it already includes other stakeholders.

### **What should the clearance levels be?**

Clearance levels should be on a sound scientific basis and be both clear and transparent. Ideally the UK should follow/align their approach with international guidance/levels from either the EU or IAEA and therefore introduce nuclide-specific clearance levels.

Clearance levels should be task based i.e. for free release (general/unconditional clearance) the hypothetical level could be 5, but for limited reuse (specific clearance) the hypothetical level could be 10. For re-use within the industry (i.e. it is not cleared) the level could be 100.

Any change in clearance levels needs government policy and should have the total involvement of stakeholders and be publicly acceptable. It should involve CoRWM and NRPB (health aspects).

To obtain and sustain buy-in by users the resulting metal ingots or the cleared scrap metal going to the melting facility should be accompanied by a clearance certificate to provide quality assurance such that when the gate monitors at the steel plants go off the operators can be re-assured that the levels are within legal limits.

It was noted in discussion that Defra reviewed clearance levels a few years ago (Hill et al, 1999; Martin, 1999) and decided not to change the system. There is a risk that in a new system the industry could get the worst of both worlds: where the numbers in international guidance are lower, the new UK system would introduce the lower numbers but where international guidance was higher than existing UK levels the new system would retain the 0.4 Bq/g figure.

### **Is there a market whether that be internal or external?**

Whether material is used internally or externally to the origin of the material applies to metal management in general, not just melting. The NDA should lead, initially by commissioning a national feasibility study leading to a BPEO. NDA would also play

the key role in managing the metal treatment through the management and organisation of contractors. NDA should also lead the engagement with stakeholder groups.

Regulators have a key role in their interpretation of legislation to facilitate re-use. That might involve the acceptance of additional operations on site such as size reduction, melting etc.

### **Inventory – how much and when?**

The quantity of metals namely the current stocks and predicted arisings are largely known on a broad-brush basis and are being fleshed out by the NDA. There are gaps with certain waste streams undeclared at present.

The inventory should give the UK perspective, timescales should be identifiable from the life-cycle baselines and near-term plans which are being prepared.

Who should take ownership? The NDA should take ownership/responsibility for the inventory alternatively the NDA should act as facilitator and leader with site licensee contractors doing the primary work.

### **How to address public attitudes?**

The group did not wish to try to predict public attitudes, it was suggested that the NDA should take responsibility for setting up national and local stakeholder groups to seek answers.

### **Who should tackle the policy issues?**

Potential new release criteria should be led by the government departments namely the DTI and DEFRA.

There does not appear to be any commercial drive for melting and it was considered unreasonable to be prescriptive, it should be more of a situation of enabling rather than enforcing, opening up more options for decontaminating.

Melting should be championed by the NDA, policy needs to be at the government level. Although the NDA will not cover British Energy or Ministry of Defence sites it could still co-ordinate the delivery of the policy through government.

### **What is the true cost?**

True cost is wider than money, it includes quality of life, environmental benefit and discount rates. Not enough has been put into understanding the true cost of options in the past. If metals are not recycled, they must be replaced and what is the environmental impact/cost of additional mining and processing? Is this more than the environmental impact of melting and reusing the metal? More thought is required, it is suggested that work is commissioned to establish the answer; participants could include the NDA, NII and CoRWM.

### **Why not just send it all to the LLW Repository at Drigg?**

Consideration should be made of the waste hierarchy, the front-end should be looked into – how activities can be done to minimise the creation of waste in the first place.

Is Drigg disposal too cheap? (Small users don't think so). Drigg is currently a resource of "UK Plc", will there be a Drigg 1, 2, 3? All things being equal it would be better to send smaller more concentrated packages to Drigg to prolong it as a resource, which could be achieved using melting.

The cost of sending material to Drigg is by the cubic metre and by activity, so there is a need to compare the cost of activity in 1 volume and the same activity in a fraction of that volume (simple volume reduction melting). What is the disposal cost for metal just above the Substances of Low Activity exemption level of 0.4 Bq/g and the disposal cost for the resulting secondary waste from melting – does the difference pay for treatment (recycling)?

In the future, will there be a LLW repository, other than one that is also for ILW. If there is no Drigg 2, and LLW is not allowed, treatment of ILW metals by melting to achieve LLW and secondary waste would be harder to justify. On the other hand, high disposal costs for the repository would encourage investigation of melting, if disposal costs are per volume rather than per GBq.

Future environmental taxes may create a more level playing field for melting v disposal.

As for who should be responsible for a facility – surely the Government.

### **Who should take overall responsibility and sponsor joined up thinking?**

The NDA should take the lead. The NDA currently hold the purse strings and no other body was seen as being able to do it. There is need for triangular working. Consultative relationships have been initiated but it is still in its infancy. There is a need for triangular working with regulators and licensees, rectangular even with public involvement. An integrated waste strategy at all levels is required with incentivisation at lower levels. Life cycle baselines and near term work plans are not adequate and may be counterproductive, they are seen as management tools rather than a relevant strategy.

## **2.3 Panel Discussion**

Having discussed the subject widely during the day, two questions were posed

- Is melting a good thing to do?
- Who should take responsibility for getting an answer?

Four organisations were suggested as the ones to be charged with finding the answer: NDA, CoRWM, Defra and DTI.

The terms of reference of CoRWM is, however, to look at the more active waste, that is LLW that doesn't meet Drigg acceptance criteria, SNF, Pu, U, HLW and ILW.

LLW that is acceptable for disposal at Drigg is outside the scope of CoRWM.

Although there is a catch all of 'in the course of its engagement with stakeholders and the public the issues outside the Terms of Reference, these shall be fed back to government. Melting is currently one of CoRWM's long list of options, along with burning of Pu and U and incineration, however, it could be short-listed out by February because they could be considered operational treatment activities rather than long-term management options. CoRWM role is to recommend what happens after the NDA.

One possible mechanism for taking it forward are some of the national groups referred to looking at decommissioning practices, such as the SD-SPUR, it is non-executive, or the SITF (Safety Issues Task Force). These organisations could look at the stakeholder issues and the economics but they will need funding.

Melting is a tool that may be beneficial for waste minimisation. Recycling and off-site re-use already enshrined in regulations and guidance. A safety case would be required for a new process which favours cold processes. The management of metals waste from the nuclear industry is an issue but there is an existing route for it.

## **2.4 Closing Remarks**

Janet Wilson from the HSE closed the workshop with the following sentiments:

- There is a desire to get on with the clean up and
- As a regulator, give me a proposal – we are prepared to listen.

## **3 Concluding Remarks**

### **3.1 Chairman's Post Workshop Remarks**

1. The key question is 'What is the optimum strategy for the management of the UK's metallic radioactive waste?' Melting is a possible component of such a strategy.
2. Since the NDA will become responsible for the decommissioning of the UK's nuclear liabilities, it will be the obvious organisation to take responsibility for ensuring that the above question is answered. It was suggested until then that the idea could be progressed via the SD-SPUR initiative under the aegis of the industry-led Safety Issues Task Force. This had the support of the workshop.
3. The technical feasibility of melting radioactive metal on an industrial scale has been proven at the Centraco facility in France and the Studsvik facility in Sweden.
4. The economic operation of a melting facility has been demonstrated by the Studsvik facility in Sweden. However, this has been in a regulatory regime of favourable clearance levels and in the context of sufficient stakeholder support. Neither of these requirements currently exists in the UK, but the situation could be changed if it were demonstrated that melting were 'the right thing to do'.
5. The economic evaluations that have been carried out in the UK to date have used disposal costs that have been based on those for Drigg. However, these are not appropriate when the totality of the UK's metallic waste is considered. Drigg cannot accommodate all of the UK's low-level decommissioning waste and an economic assessment is required that is based on a replacement for Drigg. This assessment should consider siting, licensing, construction and operational costs (including aggregating and stockpiling prior to melting). It is noted that current UK Government policy for bw-level waste that meets the acceptance criteria for Drigg is near surface disposal and that this category of waste is outside the Government's Terms of Reference for CoRWM.

### 3.2 Response from Mark Hannan (NDA Team)

The Steering Group of SD-SPUR are now going to discuss our collective suggestion at their meeting on 20th October 2004.

## 4 References

Buckley M., Handy B. and Z. K. Hillis, *Literature Review of the Potential Application of Metal Melting in the UK Nuclear Sector*, NNC Report 11426/TR/001 Issue 3, September 2004.

European Commission, 'Practical Use of the Concepts of Clearance and Exemption – Part I Guidance on the General Clearance Levels for Practices', *Radiation Protection 122*, European Commission, 2000.

European Commission, 'Recommended Radiological Protection Criteria For The Recycling Of Metals From The Dismantling Of Nuclear Installations', *Radiation Protection 89*, European Commission, 1998.

European Commission, *Council Directive 96/29/EURATOM of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation*, Official Journal of the European Communities, OJ L159 29/06/1996, p0001 - 0114.

Gerchikov MY, Hillis ZK et al, Evaluation of the Application of the Concepts of Exemption and Clearance for Practices According to Title III of Council Directive 96/29/EURATOM of 13 May 1996 in EU Member States, Radiation Protection Series No 134, European Commission, 2003.

Hill M. D., Thorne M. C., Williams P., Leyson-Jones P., *Derivation of UK unconditional clearance levels for solid radioactively contaminated materials*, DETR/RAS/98.004, Department of the Environment, Transport and the Regions Commissioned research for Radioactive Substances Division, UK, April 1999.

IAEA, Food and Agriculture Organisation of the United Nations (FOA), International Atomic Energy Agency (IAEA), International Labour Organisation, OECD Nuclear Energy Agency, Pan American Health Organisation, World Health Organisation (WHO), *International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources*, Safety Series No 115, IAEA, Vienna, 1996.

Martin A., *Review of compliance of Exemption Orders with requirements of the BSS Directive*, DETR/RAS/99.015, Department of the Environment, Transport and the Regions Commissioned research for Radioactive Substances Division, UK, December 1999.

## 5 Glossary

**Clearance:** release of material from a regulated practice/work activity from the requirements of the Directive for disposal, reuse or recycling if the radioactivity content is below so-called 'clearance levels' (European Commission, 2000).

The term clearance is reserved for the release of material which does not require further regulatory control to ensure the actual destination of the material (European Commission, 2000). Thus avoiding regulatory resources being wasted in situations where there would be little or no benefit (European Commission, 2000).

**Clearance levels:** values established by the national competent authorities, and expressed in terms of activity concentrations and/or total activity, at or below which radioactive substances or materials containing radioactive substances arising from any practice subject to the requirement of reporting or authorization may be released from the requirements of the Directive for disposal, reuse or recycling (European Commission, 1996; European Commission, 2000).

The notion of 'specific clearance levels' has been introduced for specific conditions which can be verified prior to release while 'general clearance levels' are for any possible application, there are no restrictions on the origin or type of material to be cleared (European Commission, 2000).

With 'general clearance levels' the material does not require a specification in regard to future use, recycling, reuse or the final disposal. The destination is not defined and consequently these possibilities must be taken into account when deriving the clearance criteria and it must be ensured that the levels for *general* clearance are equal to or more restrictive than *specific* clearance levels for different options (European Commission, 2000)

'**BSS**' International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (IAEA, 1996).

'**The Directive**' Council Directive 96/29/EURATOM (European Commission, 1996).

**BPEO** Best Practical Environmental Option

**CoRWM** Committee of Radioactive Waste Management

**DEFRA** Department of Environment, Food and Rural Affairs

**Drigg** UK LLW Repository at Drigg near Sellafield in Cumbria

**DTI** Department of Trade and Industry

**EC** European Commission

**EU** European Union

**HLW** High Level Waste

**IAEA** International Atomic Energy Agency

**ILW** Intermediate Level Waste

**LLW** Low Level Waste

**NDA** Nuclear Decommissioning Authority

**Ni** Nickel

**NRPB** National Radiation Protection Board

**Pu** Plutonium

**SD-SPUR** Site Decommissioning – Sustainable Practices in the Use of Resources

**SITF** Safety Issues Task Force

**SNF** Spent Nuclear Fuel

**U** Uranium

# Appendix A - Workshop Agenda

<p style="text-align: center;"><b>“Potential Wider Application of Metal Melting in the Nuclear Sector”</b></p> <p style="text-align: center;"><b>A Workshop Facilitated by the HSE</b></p>			
	Birchwood Conference Centre – Lecture Theatre Wednesday 6 October 2004 9.00-16.00		
9.00	Registration and Coffee		
9.30	Welcome & Introduction	Dr Mark Dutton	
9.35	Keynote/Scene setting	Prof Gregg Butler (Professor of Science in Sustainable Development, University of Manchester)	Metal Melting in the Nuclear Sector – Why Not? and When?
	<b>Proven Experience from abroad on Melting Applications</b>		
9.50	FRANCE - Centraco	J Faugieres (Commercial Manager of SOCODEI, the Operator) – <b>Presented by Mark Dutton</b>	SOCODEI Experience in Melting and Incinerating Low Level Radwaste
10.05	SWEDEN- Studsvik	Björn Amcoff (Project Manager Sales UK)	Studsvik Radwaste
10.20	Coffee		
	<b>Perspective from the Waste Owners</b>		
10.30	UKAEA	Michelle Wise (Head, Technical Services Group)	Metal Melting Technology

10.45	British Nuclear Group	Jack Williamson (Head of site remediation)	The Sellafield Challenge
11.00	NDA Team	Mark Hannan (NDA Team)	NDA strategy and melting
11.15	British Nuclear Group, Berkeley Centre	Bill Williams	Application of High Temperature Melter Technology to Radioactive Wastes
11.30	Workshop session 1		
12.00	Workshop group feedback		
12.20	Lunch		
	<b>Stakeholder Perspective</b>		
13.00	Bigstone	Dr Jane Hunt	Stakeholder issues
	<b>Disposal Aspects</b>		
13.15	UK Nirex Ltd	Simon Wisbey	Disposal Issues – Nirex Perspective
	<b>Regulator Perspective</b>		
13.30	EA	Dave Bennett, Policy Manager, Radioactive Substances Regulation	Metal melting for the nuclear industry: an Environmental Agency perspective
13.45	NII	Glyn Davies, HM Principal Inspector	Radioactive waste regulation in the UK – A quick review
14.00	Workshop session 2		

14.30	Feedback from workshop groups		
15.00	Coffee		
15.15	Panel Discussion for presenters	Mark Dutton, Chairman	Discussion of the main issues.
15.40	Summary and Closing Remarks	Janet Wilson (HSE)	
16.00	Close	Mark Dutton	

## Appendix B - List of Attendees

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