

## Snack 8 Conceptual Circular Supply Chain Design Workshop

### Overview

The UK submarine dismantling programme was used as a conceptual case study to explore what is required to develop a circular supply chain for recovering critical materials from end-of-life defence equipment. The programme is currently addressing a backlog of 23 decommissioned submarines, with one vessel serving as the pathfinder for applying circular approaches. The workshop focused on how the UK could build a resilient, circular reclamation supply chain by examining this programme in detail. The overarching ambition is to recycle or repurpose around 90% of materials and to involve a broader range of industry partners. The session combined presentations with breakout discussions on UK capabilities, opportunities, barriers, business models, circular design, and research needs.

### Context

Recent policy developments—including the Defence Industrial Strategy, the Critical Mineral Strategy, and the forthcoming Circular Economy Growth Plan—are creating renewed focus on strengthening defence supply chain resilience, with targets such as meeting 20% of UK industrial demand for critical minerals from recycling by 2035 driving momentum for circularity. A review of UK capabilities highlighted notable strengths, including strong capacity for ferrous and non-ferrous metals recycling and regional clusters of relevant expertise. However, several gaps remain, such as limited battery recycling capacity (primarily focused on lithium-ion), minimal rare earth and magnet recycling capability, incomplete end-to-end circular material systems, and the loss of critical industrial skills and knowledge.

### Key Discussion Points

#### 1. Current Capabilities & Knowledge Erosion

- UK R&D activity is growing, but overall capability starts from a low base due to lost skills and infrastructure.
- Asset handling and reclamation capacity remain major constraints.

#### 2. Material Purity and Repurposing

- Defence-grade material purity requirements prevent many reclaimed materials from being reused directly in defence.
- Repurposing into broader UK industry is a viable option.
- A systems-wide approach is needed to connect defence with other industrial sectors.

#### 3. Design for Recycling

- Future defence equipment should be designed with recovery and recycling in mind.
- Manufacturers will need contractual or policy incentives to implement design-for-recycling practices.

#### 4. Reclamation vs. Recycling

- **Reclamation:** restoring materials to their original specification for the same use.
- **Recycling:** converting materials for alternative uses, often at lower grade.

- Quality loss during recycling affects both material value and reuse potential.

## 5. Commercial and Strategic Considerations

- MOD disposals functions currently manage selling and repurposing equipment.
- Alternative ownership models, such as leasing or retaining materials, could improve strategic resource security.

## Actionable Insights

### 1. Address Industrial Capability Gaps

- Invest in revitalising domestic steel, magnet, and high-grade processing facilities to rebuild critical industrial capabilities.
- Explore energy-efficient technologies or incentives to reduce high operational costs and improve competitiveness.
- Encourage reshoring of key parts of the value chain to strengthen national resilience.

### 2. Support Scaling and Funding of Technologies

- Provide targeted government funding or grants to scale laboratory recycling technologies to industrial levels.
- Develop mechanisms to create domestic demand for recovered materials, strengthening commercial viability.
- Introduce programmes to bridge the “valley of death” in technology commercialisation, supporting innovative circular solutions.

### 3. Leverage Policy and Strategic Interventions

- Consider regulations to restrict export of critical waste materials, retaining value within the UK.
- Establish a centralised UK capability database to identify and coordinate resources across sectors.
- Prioritise high-value materials to focus investment and make circular business cases commercially attractive.

### 4. Enhance Cross-Sector and International Integration

- Integrate defence circularity efforts with wider UK industry to create a cohesive supply chain.
- Identify opportunities for collaboration with aligned international partners where domestic processing is insufficient.
- Navigate export control restrictions strategically to enable compliant cross-border material processing.

### 5. Rebuild Skills and Expertise

- Invest in training, education, and apprenticeships in materials science, metallurgy, and process engineering.
  - Partner with academic institutions and industry to rebuild the UK's technical knowledge base and capability pipeline.
6. Promote Design for Recycling
- Encourage manufacturers to adopt design-for-recycling principles in future defence equipment.
  - Implement contractual or policy incentives to ensure circular design is prioritised.
7. Improve Material Reclamation and Repurposing
- Develop systems to assess material purity and determine suitable repurposing pathways.
  - Create frameworks linking defence material recovery to broader industrial use.
8. Explore Commercial and Strategic Models
- Evaluate alternative ownership models, such as leasing or retaining materials, to secure strategic resources.
  - Optimise MOD disposal processes to maximise value recovery and circular outcomes.

### Summary

The session confirmed that the UK is at an early stage in developing a circular defence supply chain. While metal recycling capacity is strong, significant gaps remain in high-value processing, technical skills, incentives, and the ability to scale technologies. The submarine dismantling programme offers a practical case study, but achieving broader circularity will require strategic policy support, cross-sector collaboration, new business models, and design-for-recycling approaches. Next steps include updating the sector-wide draft paper and continuing community engagement through targeted themed sessions.

### DCRM Snack – Next Steps

This was the final snack session of 2025. All materials from previous sessions are available for download on the Team Defence Information website.

The 2026 snack series will begin on **14 January** with *The Where of Waste*, followed by sessions covering a deep dive into battery recycling, engagement with Defence Primes, MOD updates, NATO, and Innovate UK.

Insights from the snacks highlight that mining defence waste is a complex challenge involving multiple stakeholders with no single owner. An emerging concept is to establish **An Ecosystem for Critical Material Security**, bringing all parties together in a collaborative, collegiate manner.

A draft paper outlining this concept will be shared for review and comment. Its objectives are to:

1. Spark discussion and collaboration across stakeholders.

2. **Inform the development of a Defence Sectoral Approach** for securing critical materials through circularity.
3. **Potentially lead to direct funding** for UK industrial base reclamation capabilities.