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Radioactive Waste Inventory Forecasting and Characterisation Implications for Packaging and Transport

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Introduction

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- Radioactive Waste Management is complex and consists of many different stages, such as;

Waste Forecasting	Waste Characterisation
Waste Segregation	Waste Treatment
Waste Conditioning	Packaging and Development
Supply Chain Facilities	Direct Disposal Site Location
Long Term Interim Storage Site Location	Optimisation of finite National Resources

- However, the first step requiring significant attention is accurate Waste Inventory Forecasting and Waste Characterisation i.e. How much and in What Form

UK Categories of Radioactive Waste

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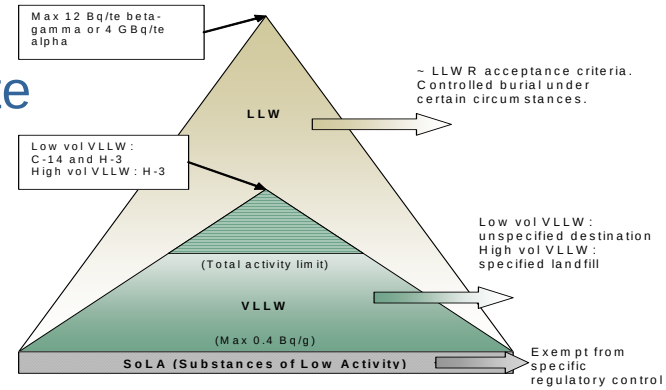
- High Level Waste (HLW); High Temperatures
  Normally Well Characterised
- Intermediate Level Waste (ILW); Exceeding 4GBq/te & 12GBq/te
  Temperature impact not same as HLW
- Low Level Wastes (LLW); <4GBq/te & <12GBq/te
- Very Low Level Wastes (VLLW); <40MBq/te



Regulations Relating to Radioactive Waste

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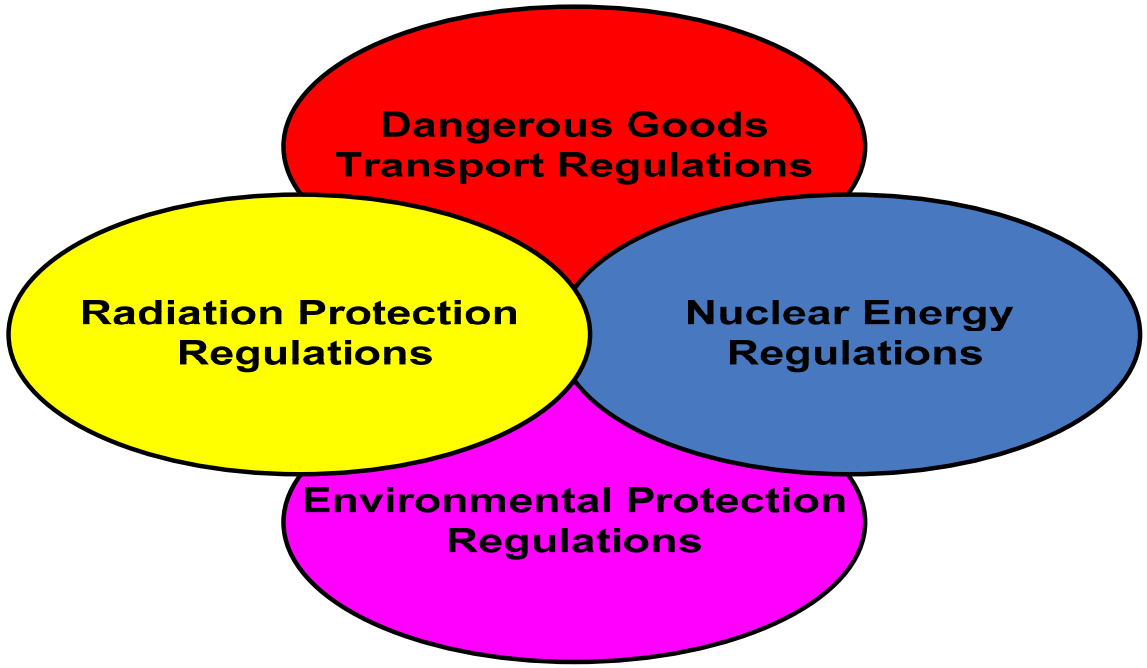

- International and national transport of radioactive waste is a demanding task, due to the regulatory requirements

UK Radioactive Waste Inventory - Current Position

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NDA
Nuclear Decommissioning Authority

Private Sector

~ 3,430,000m3

Source: BRIMS Inventory, 2007

x3

Or

x 33,627

UK Radioactive Waste Inventory - Frequency / Data Collation

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UK Radioactive Waste Inventory

- Collected on a 3 yearly basis
- Both Nuclear and Non-Nuclear Industries
- Captures Radioactivity data for 112 radionuclides
- Reported at Wastestream level
- **Captures transport related data e.g no of packages, packing efficiency, designated package type etc.**

Waste Accountancy Templates

- Collected Annually for the 20 NDA Sites
- Reported at Wastestream level
- Captures additional information to the UK Radioactive Waste Inventory e.g. in-situ, in-process, conditioned and disposal volumes
- Does not capture Radioactivity data
- Captures treatment opportunities

UK Radioactive Waste Inventory - Current Position

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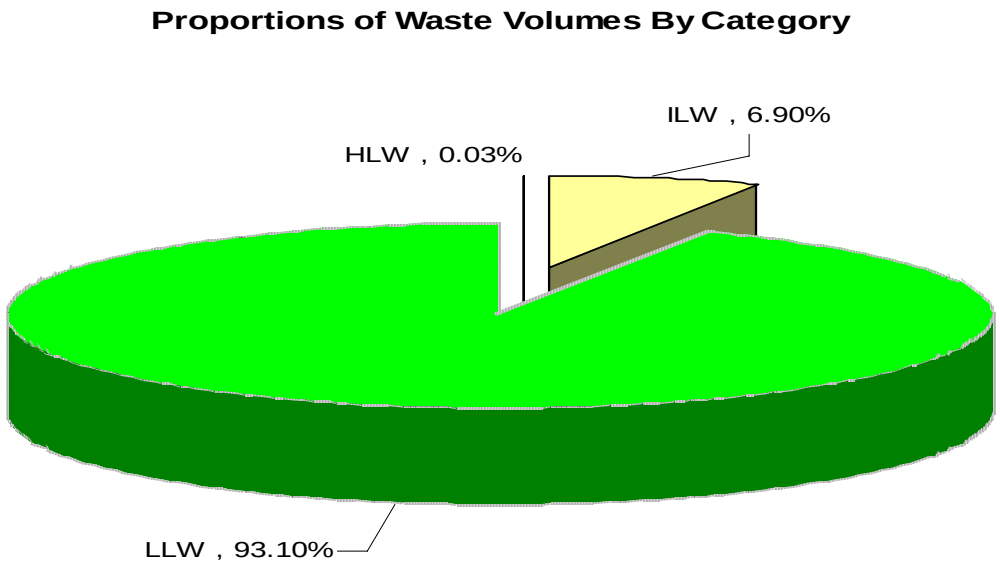

	HLW	ILW	LLW	Total
Volume (m3)	1,090	236,000	3,190,000	3,430,000
Mass (te)	2,900	270,000	3,600,00	3,900,000

Data Source: The 2007 UK Radioactive Waste Inventory (Defra/RSA/08.002; NDA/RWMD/004); Section 4.2

UK Radioactive Waste Inventory - Package Implications

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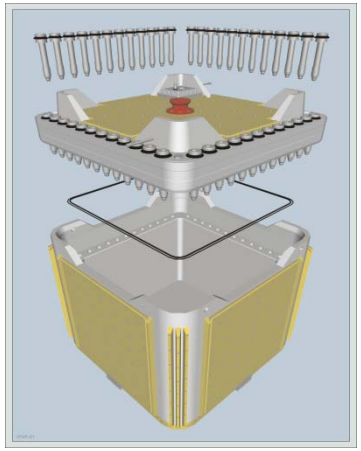

	HLW	ILW	LLW	Total
No. of Packages Required	7,250 (equivalent package volume of 1,420m3)	200,000 (equivalent package volume of ~364,000m3)	89,200 (equivalent package volume of ~3,470,000m3) Note. Excludes wastes destined for landfill and assumes all LLW is packaged. Figure also includes 8,272 packages already in LLWR Vault 8	296,450

Data Source: The 2007 UK Radioactive Waste Inventory (Defra/RSA/08.002; NDA/RWMD/004); Section 4.2

Case Study of the LLW Repository Ltd (LLWR)

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- LLW Repository adjacent to Sellafield
- National disposal facility for LLW since 1959
- Uses UK Radioactive Waste Inventory data to inform:
  - Site operations Planning
  - Environmental Safety Case
  - Strategy / Lifetime Plan Baseline
  - Package and transport requirements

UK Radioactive Waste Inventory - LLWR Implications (Case Study)

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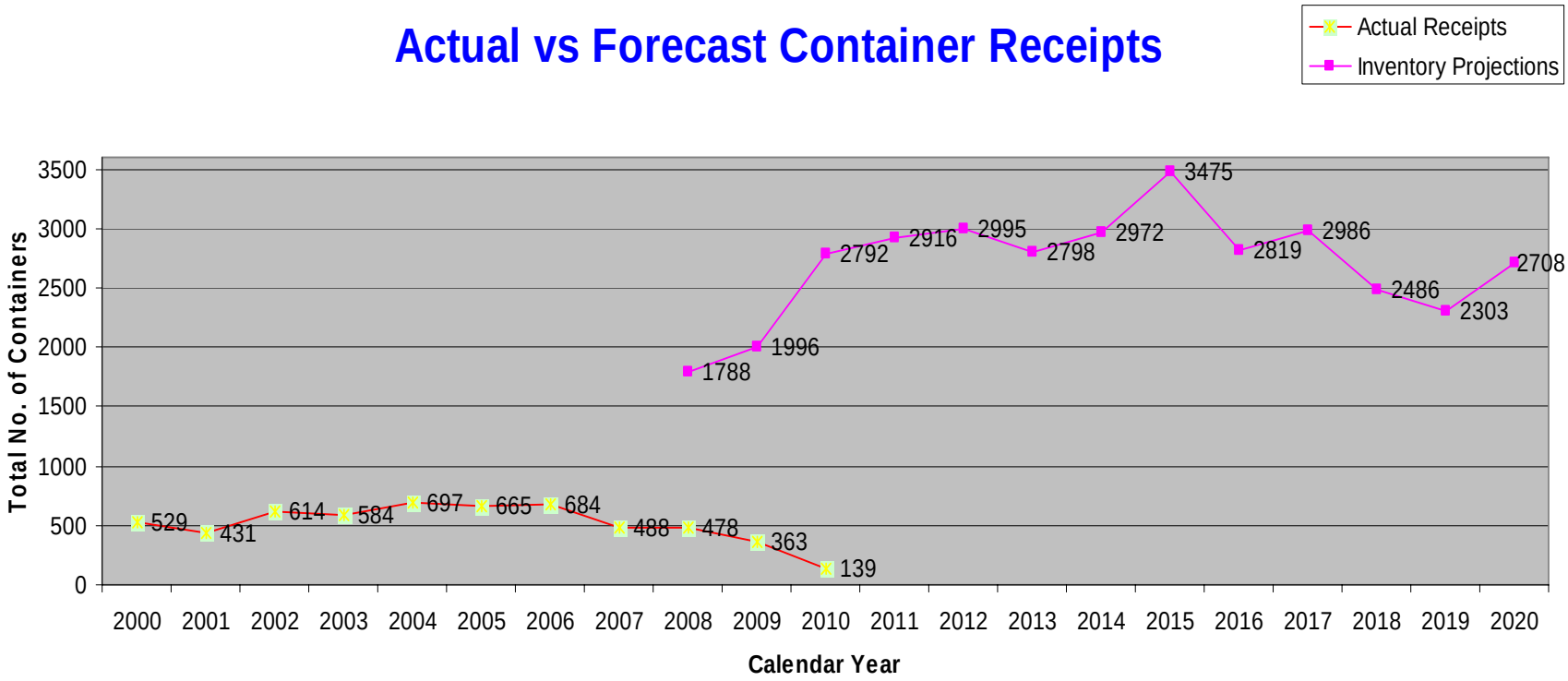
Actual vs Forecast Container Receipts



UK Radioactive Waste Inventory - LLWR Implications (Case Study)

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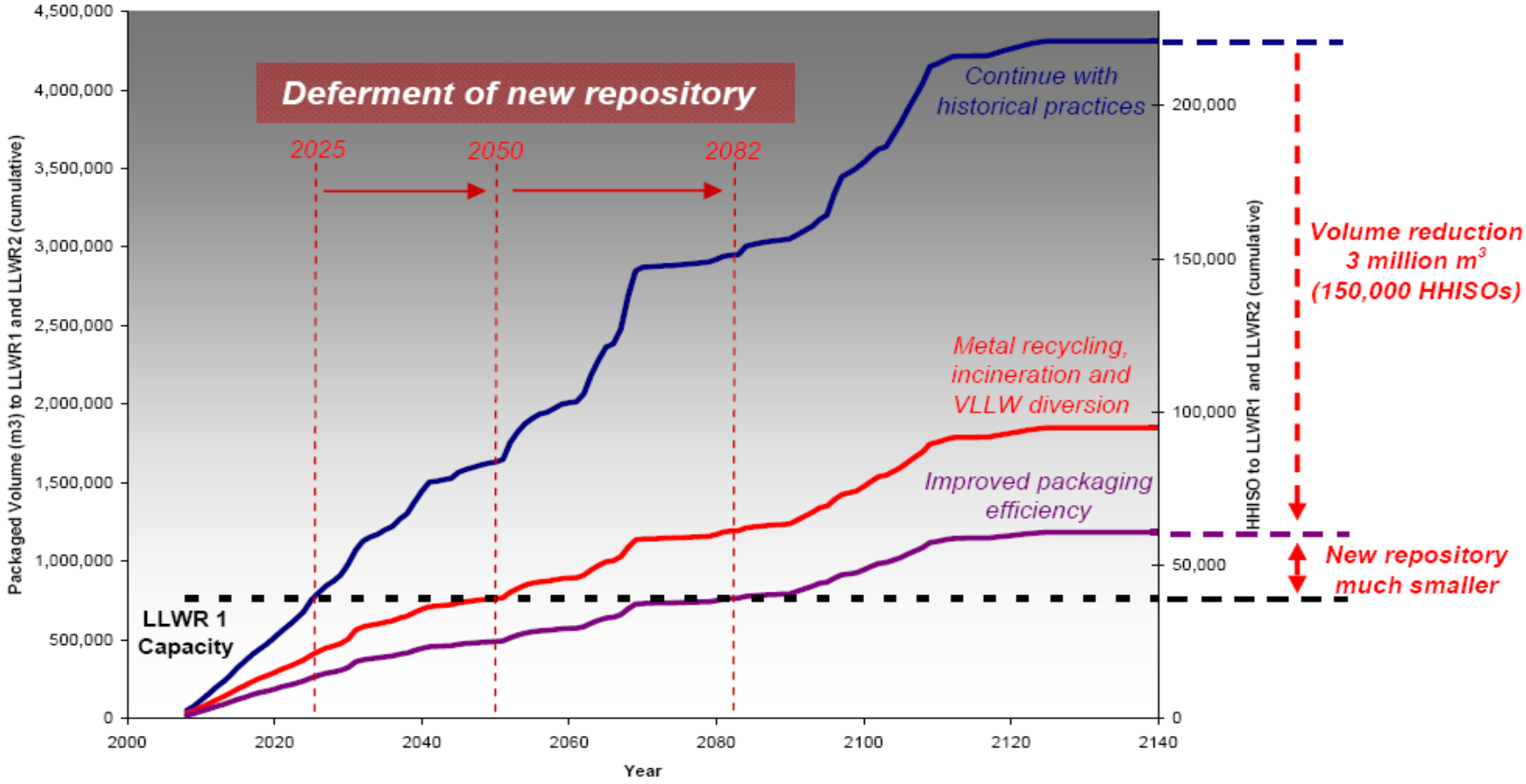

LLWR Case Study
- Elements of the WIFI Portfolio

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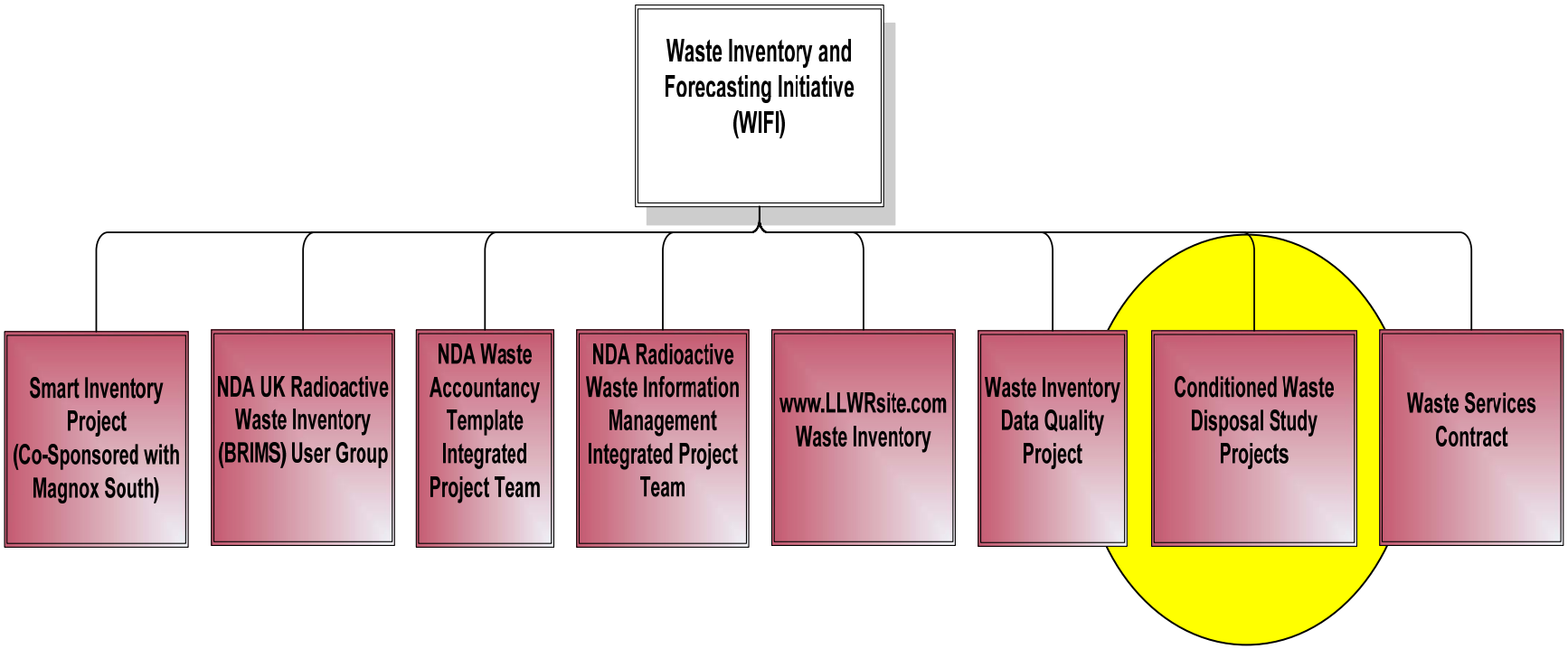

- Several concurrent projects with a common strategic aim

Waste Characterisation

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- Some waste types are problematic and present challenges in characterisation:
  - Fission Products i.e. FED, Resin, Sludges, PCM (Fissile Content)
  - Activation Products i.e. Neutron activation of stable isotopes (analysis techniques)
  - Actinides & their decay products i.e. U, Pu, Np, Am etc (analysis techniques and build of up dose)
- A common question which is raised - “Is there a potential opportunity to rationalise design of packaging for these ‘broad groups’ of waste?”

WNTI Working Group

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- Established in 2009
- Four task leaders were appointed;

Marc Flynn (**Gareth Garrs**) - Characterisation/Classification of wastes

Jurgen Werle - SCO and large Objects

Pierrre Malesys - Dual Use Casks

Bruno Desnoyers - Fissile Exceptions

WNTI Waste Working Group Terms of Reference (ToR)

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Early identification of Issues: To identify issues affecting the transport of wastes which are of importance to WNTI members and need to be addressed to ensure the safe and efficient transport of radioactive waste.

Develop consolidated industry positions: Share useful information, collect and disseminate examples of good-practice. Develop consolidated industry positions to particular problems. Liaise with other WNTI working groups when required.

Influence: Develop a WNTI industry perspective on particular waste/transport issues. Feed into the IAEA or Regulation review process as and when appropriate.

Conclusion

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- WNTI waste working group to continue focusing on the four task areas. With immediate attention being placed on Waste Inventory Forecasting and Characterisation techniques to question:
  - the classification of wastes into broad groups (similar characteristics) to rationalise the choice and design of packaging
  - how these principles can be adapted for package design, safety cases
  - how best to accommodate these principles in future editions of TS-R-1

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