

Looking to the future

PATRAM  **2010**

Looking to the future

PATRAM 2010



RAPPORTEUR REPORT of Tuesday 5th October

**Stephen Whittingham
Department for Transport
London**



Key messages

High Level waste / Security

▶ T10 - HLW Waste

- ◆ Return of vitrified and compacted waste from reprocessing plants to countries of origin are in progress, at various stages depending upon the waste and country
- ◆ In disposal programmes; waste volume reduction, standardisation, transport programmes for ~100 years and infrastructure provision are issues that need to be considered both technically and for public perception /acceptance considerations
- ◆ Gap analyses are needed to compare current knowledge and experience against the types of waste arising in the future, with the long-term storage of high burn-up fuels being cited as an example

▶ T11 - Security

- ◆ There would be future benefits to develop a process of approving vehicles carrying radioactive sources similar in concept to the processes to approve security protection designs of vehicles that carry sensitive nuclear materials
- ◆ The nuclear renaissance will create a significant increase in the number of shipments of Front End material
- ◆ Developments in global monitoring and real time tracking technologies continue as a means to mitigate the risk of loss or misuse of packages



Key messages

Thermal Studies / Burn-up credit

▶ T12 - Thermal studies

- ◆ Three dimensional fire simulations developed by Sandia Labs offer excellent accuracy when compared to experimental data
- ◆ Operational experience of UF6 packages is driving industry to review and optimise the use of thermal protection equipment to reduce the logistical burden of their use
- ◆ The need to validate thermal assessment modelling by physical testing continues to be acknowledged

▶ T9 - Burn-up credit

- ◆ Burn-up credit will increasingly become a necessary safety case component for spent fuel cask designs especially for the transport of long-term stored fuel that may be higher enriched to achieve the future higher burn-up ratings and the increased cask payloads achievable due to lower heat ratings.
- ◆ The need also applies to geological disposal facilities where compact storage may be required to increase the utilisation factor of the facility



Key messages

Transport of large components / Front end & recycled material

▶ T14 - Transport of large components

- ◆ Successful experience of users gained in several countries
- ◆ Best practices for the necessary transport of large components resulting from the decommissioning programmes of redundant nuclear plants and fuel cycle facilities will result in further guidance in the 'Advisory Material' TS-G-1.1
- ◆ Alternatively, some components may be segmented and stored and/or transported in large storage and transport casks

▶ T15 - Front end & recycled material

- ◆ Increased volumes of Uranium production, changes in delivery routes, delivery schedules for GEN3+ reactors and the management of UF₆ tails pose challenges over the next ten years
- ◆ The accumulation of experience in transporting MOX and Pu in Japan over the last 35 years has been used to inform their future MOX transports programme



Key messages

Criticality analysis / Impact limiter materials & structural materials

▶ T13 - Criticality analysis

- ◆ Perturbation analysis of package designs is being used to assess the contributions of various parameters to criticality safety
- ◆ The effects of thermally degradable materials such as polyurethane foam under accident conditions are being validated by modelling charred foam
- ◆ Methodologies for fissile exceptions are necessary future developments in the criticality assessment of future waste package designs

▶ T17 - Impact limiter materials & structural materials

- ◆ The manufacturing capacity of large forgings for monolithic spent fuel cask designs may not meet industry demands due to the effects of the nuclear renaissance and the decommissioning programmes over the coming years
- ◆ The development of a dynamic fracture toughness test programme for cast iron casks in Germany will better replicate crack propagation under dynamic loadings.
- ◆ Investigations into the use of polyurethane foam in shock absorbers and drums for storage and the control of radiolysis gas generation in spent fuel casks are necessary for future interim storage safety cases.



Key messages

Regulations – a future paradigm / Denial and delay of shipments

- ▶ P2 - Regulations – a future paradigm
 - ◆ Complex regulatory structures need to be explained, rationalised and harmonised with interpretation by countries being a subject of discussion in its own right.
 - ◆ Stability in regulations and their interpretation will promote safety
 - ◆ Several approaches to regulating industry are available and the selection of the most appropriate should be justified using performance indicators
- ▶ P1 - Denial and delay of shipments
 - ◆ The global situation is difficult to summarise and the number of reported denials and delays cannot be used as a measure of the problem
 - ◆ Many routes are not available and therefore not always reported
 - ◆ Training and information will help at the individual and corporate levels but a multi-agency holistic approach is also necessary to engage major carriers
 - ◆ There are real and significant patient health consequences to the denial of class 7 goods for the medical sector
 - ◆ Solving the denial of shipment issue is a necessary precursor to providing the viable delivery routes necessary to meet the needs of the developing countries



Key messages

Crush testing of lightweight packaging / Quantification of safety in transport

- ▶ P3 - Crush testing of lightweight packaging
 - ◆ clarification and agreement of interpretation of dynamic crush testing of package designs is important as such small lightweight packages may be subjected to such loadings during their operational life
- ▶ P4 - Quantification of safety in transport
 - ◆ The management of risk is important feature of competent authority work to inform their resource deployment
 - ◆ Identification of themes and trends in non-compliances with regulatory requirements is important if safety is to be improved and targeted guidance produced
 - ◆ In France risk assessments are required by harbours, marshalling yards, and truck parking. Industry must develop the risk assessments based upon ASN defined scenarios – the cost is borne by industry
 - ◆ Web based routing tool for road transport of hazardous material is being developed in USA based on security and safety considerations; eg routing away from iconic structures, critical infrastructure, densely populated areas, etc



Key messages

Long term storage strategies / Waste management

▶ T20 - Long term storage strategies

- ◆ There is a key strategic importance to address the issues faced when spent fuel has been stored for decades and then it has to be transported in the public domain to a disposal or conditioning facility. This will require Regulator approval of management systems, inspection regimes, acceptance criteria, etc
- ◆ The design of interim storage systems need to consider the whole lifecycle which will include transport, either before or after the storage period
- ◆ In Germany canister and transfer casks for future disposal of spent fuel are being designed

▶ T18 - Waste management

- ◆ Continued developments in waste characterisation, package designs, direct disposal of spent fuel into bore holes and revised transport regulations are necessary areas of development for the decommissioning and waste industry sectors
- ◆ Such continued developments will ensure compliance with regulatory requirements enabling internationally accepted levels of safety to be achieved in a cost effective and robust manner



Key messages

Drum packages / Structural benchmarking

▶ T37 - Drum packages

- ◆ Type IP packages are used for low level activity wastes and the future adoption of the waste hierarchy will introduce the need for re-usable packagings and transports to recycling facilities
- ◆ Wastes which have subsidiary risks require careful consideration to justify their regulatory compliance.
- ◆ A methodology has been developed to demonstrate compliance with the LSA requirements when the package contains larger low level waste components

▶ T19 - Structural benchmarking

- ◆ The importance of benchmarking / validating input parameters remains a vital feature of finite element modelling
- ◆ The adoption of finite element modelling to reduce or replace impact testing to reduce costs and timescales for package design development and CA approval remains an ambition of many package designers

Looking to the future

PATRAM 2010



Thank you for your attention