National Status of TRU disposal

Canada:

- LLW is defined by exclusion: includes all waste that is not spent fuel or U-tailings; sub-classed as historic waste and ongoing waste.
- Historic waste dominated by Ra- refining waste located around Port Hope; federal government accepted responsibility. Two surface facilities planned for long-term management are in the environmental assessment phase.
- Ongoing LLW mainly from reactor operations; utilities distinguish ILW (needs shielding) and LLW (no shielding).
- OPG proposed a Deep Geologic Repository (660 m depth in limestone) at the Bruce site for LILW and reactor decommissioning waste only (see Block 3); aim to be operational by 2017.
- For spent fuel, NWMO 3-year study recommended Adaptive phased Management; awaiting government response.
- Regulations: CNSC approach non-prescriptive, no distinction between different classes of waste. Draft Regulatory Guide on long-term safety issued for comment in 2005.

Finland:

- Concern only for SF – so no real equivalent to Japanese TRU
- L/ILW repositories at both NPP sites (silos – LLW in rock silo, ILW with concrete wall)
- LLW < 1 MBq/kg, ILW < 10 GBq / kg, but flexible as the key is that the implementer needs to meet safety guidelines.
- Note new NEA guideline on categories of waste – suggest caution on its applicability
- Non-power wastes – temporally stored for disposal with LLW / ILW
- Decommissioning wastes will be considered further in the future. Assumed, at present, disposal with L/ILW but with SF also possible.
- Different regulations for SF and L/ILW, proposals for future combination (based on SF)

France:

- All waste not acceptable for surface/sub-surface disposal (significant

longer lived RN concentrations) is classified as C (HLW vitrified waste) and B (the rest). Spent fuel is not considered as ultimate waste in France

- B waste ~70,000m3 (whatever the reprocessing scenario in the future), many types of waste and conditioning (main waste contributor is the reprocessing activity)
- Regulatory disposal timescales similar for B and C with slightly different constraints on package containment:
    1. C waste package must confine while activity of short- and medium-lived RN is predominant
    2. B waste package confinement to be assessed for a period sufficiently long in terms of decay of short- and intermediate-lived fission products.
- Implicit assumption of co-disposal (no special discussion) by the stakeholders (implementer, waste generators, nuclear safety authority))
- Waste is separated into groups – supposedly eases reversibility (to be shown for 100a); standardised emplacement packaging (disposal package grouping up to 4 primary waste packages, fork-lift transfer for B waste), no special engineered barriers (due to predicted high geological barrier performance)

Germany:

- All radwaste decided to go for deep geological disposal; Waste categories defined only in terms of surface dose rates – HLW / ILW / LLW
- Konrad repository, specific for non-heat emitting waste (rock temp not increased more than 3K by waste emplacement)
- Konrad (very dry, old iron ore mine, 1200m below surface) has evolved since 1975; license application 1990, granted 2002, blocked by legal action – final decision expected 2007 with possible waste emplacement 2011
- Political desires for “one repository”, “best site” and ”retrievability” defined to be incompatible with the governing Atomic Act.

Sweden:

- No TRU waste category, but long-lived L/ILW is similar – predominantly from MIR and decommissioning
- Such waste envisaged for existing L/ILW repository (SFR) or co-disposal

with SF – in the latter case carefully located to avoid interactions of concrete with SF

- Preliminary PA in 1996 (based on SFR – BMA vault with a crushed rock hydraulic cage – reported in TR-99-28). Acknowledged that work not to the same level as SF. A list of key processes to be studied were listed.
- Long-lived decommissioning waste will be kept in interim store; the decisions about design, site etc. will be decided later. Inventory uncertainties (characteristics & RN inventories) also an issue

Switzerland:

- Integrated management of all wastes in Switzerland leads to co-disposal of HLW, spent fuel and TRU; this has been studied for both crystalline and sedimentary host rocks
- Regulations apply to all wastes – specifying does and risk limits which have to be applied for all times
- Detailed PA in the Entsorgungsnachweis project showed that doses for TRU were significantly higher than those for HLW and, for some scenarios even higher than those from spent fuel. Entsorgungsnachweis considers a very powerful natural barrier; in less good geology there could be difficulties meeting regulatory limits.
- When compared to Sweden, the crystalline rocks in Switzerland perform better due to the much greater depth (1200 rather than 500m) and the existence of overlying sediments (e.g. minimises effects of future glaciation).

UK:

- No TRU category – fall into long-lived ILW; mainly from reprocessing but also special case of Pu as a potential waste
- Inventory: Pu as waste – 102 tonnes – 4 EBq; recent inventory reports available.
- Time decay – after 10 ka activity ILW about same as HLW
- Key nuclides not transuranics, FAPs
- Standardised disposal packages.
- Pu – if not burned as MOX – ceramic, glass or low-spec MOX as waste form; co-disposed with HLW / SF (or deep boreholes), but little studied in terms of PA

- Repository concept fairly standard (Nirex) with option of soft backfill for ease of retrieval (now seems less necessary)
- PA for "generic UK conditions" – early doses from I, Cl & C, later Ra
- Co-disposal of long-lived ILW with HLW / SF now seems to be reference case – defines preferences for siting.
- Regulations – being re-written (past applied only to LLW) – drafts should be available next year.
- Waste substitution is another factor specific to the UK; increasing the TRU inventory to include that from reprocessing foreign fuel (replacing returned TRU by an equivalent activity of HLW)

US – Waste Isolation Pilot Plant (WIPP):

- Military TRU waste repository (legacy of weapons programme) operational for 6 years at a volunteer community.
- Inventory could change considerably if GNEP initiates reprocessing; it is not at all clear where waste from a civil nuclear reprocessing programme would go.
- Presentation focuses on the evolution of the regulatory framework and included a list of siting criteria. An important aspect may be the requirement of recertification. Involves wide range of detailed regulations and standards and the involvement of many agencies (much more complex than in other countries) – separately for contact-handled, mixed (chemical & radiological) and remote-handled waste.
- Mixed waste is a special category, which raises questions about other potential safety concerns for this type of waste.