EURADWASTE ’04

Summary of the sessions on geological disposal

No technical barriers to geological disposal

Disposal in deep geological repositories is the favoured strategy in Europe for long-lived high-level radioactive waste. Research undertaken in FP5 confirms that this multi-barrier option is technically feasible and can now be realised practically. Performance Assessment Analysis and related modelling indicate that long-term isolation of high-level waste over time scales of 1 million years or more is possible in a variety of European rock formations. These significant achievements have resulted from increasingly close international research collaboration and networking between national research institutions.

High-level and long-lived nuclear waste has been and continues to be stockpiled around Europe. At present, spent fuel and other high-level waste are safely stored in interim storage facilities prior to transfer to their final repository. The vast majority of high-level waste comes from the civil nuclear power programme.

This waste will remain radioactive for tens of thousands of years, so a storage option that ensures very long-term isolation from human intrusion and minimises environmental impact is vital. Disposal in a deep (>300 metres) geological repository is a preferred option involving multiple man-made and natural barriers to isolate the waste.

Digging deep

Considerable research was done during FP5 to evaluate repository technology, model barriers and to improve performance assessment methodologies for analysis of repository behaviour over many thousands of years. As well as technical studies, research has been carried out into public attitudes to such concepts and governance issues relating to the selection of disposal sites.

Results from a variety of projects presented at Euradwaste ’04 showed the extreme durability and resilience of individual barriers within a geological repository.

Presentations included the interaction of vitrified waste with water through the corrosion characteristics of metallic containers, and the efficacy of clay backfilling materials. Practical experiments from underground research laboratories (URLs) in a variety of rock formations – from granite to rock salt and clay – and modelling studies show that very long-term isolation is possible in all these formations.

The basic science and modelling of the behaviour and transport of radionuclides has made significant advances, but in some areas more knowledge is required to address uncertainties. In a presentation by Mikko Nykyri on the **Retrock** project, issues such as microbial mediated processes, colloidal transport, and sorption of radionuclides were highlighted.

However, all models include conservative estimates for terms where there is uncertainty, so the current predictions are highly likely to be pessimistic. Current models of radionuclide release indicate that the concentration reaching the environment would be at orders of magnitude less than background radiation levels, implying effective containment/isolation can be achieved. Modelling to address major climate change and its effects over the lifetime of repositories began in FP5 and continues in FP6.

Can we build a repository?

Currently, there is a widespread effort to establish repositories across Europe. Sweden and Finland are most advanced with their repository schemes. Sweden hosts the Hard Rock Laboratory (HRL) at Äspö, which, during FP5, demonstrated the basic engineering techniques, including waste retrieval, needed to make a real repository. Christer Svemar presented a comprehensive review of achievements, which gave rise to confidence among conference participants that a large repository could be built now and that engineering and waste-handling techniques are robust.

Finland is the only Member State to have taken the political decision to construct a deep repository. This facility will be at Olkiluoto near one of the country's nuclear power plants. Sweden will make a final selection soon from two possible sites. Many lessons have been learned about social interaction and political dialogue in discussions on repository sitings. The classical model of "decide-announce-defend"

is clearly untenable in a modern and informed European society. Constructive dialogue at various levels (local, regional and national) in an open and transparent manner is vital. The local community that agrees to host a facility must be able to see clear and concise benefits, be supported by access to experts, and a step-wise approach with no individual step being irrevocable, are all pointers to success; and this includes the potential for waste retrieval at a later date.

European Research Area

Radioactive waste disposal has long enjoyed significant research collaboration across Europe. Examples such as **Net.Excel** in FP5 and **Actinet** show high added value through sharing experimental facilities and the mobility of personnel – characteristics of a true ERA. The new FP6 instruments (Integrated Projects, Networks of Excellence) encourage larger collaborations to bring improved coherence and add weight to research efforts.

Piet Zuidema of the Swiss National Agency for the Disposal of Radioactive Waste chaired a conference session on research networking, and welcomed the new instruments but with some reservations: “In FP5, there were a variety of projects – you could pick and choose those you wanted to participate in. With FP6, there is just the one project – you are in or you are out.” Zuidema also saw a high administration burden on FP6 project coordinators, highlighted cultural issues involved in large organizations, and made the fundamental point that the ERA must support science throughout the EU rather than placing barriers to certain research in some Member States. The differing research needs of individual Member States may define the limit of ERA.