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Meeting reports

IAEA Conference on the Safety of Radioactive Waste Disposal
Tokyo, Japan, 3–7 October 2005

The conference was organised by IAEA, with support from NEA, and covered the disposal safety of the full range of disposal facilities.

A session on the global waste safety regime highlighted the poor uptake for the Joint Convention on the Safety of Spent Fuel and Radioactive Waste. Currently there are relatively few contracting parties; 34 out of a total of 139 IAEA members, compared to 54 signatories for the Convention on Nuclear Safety. The reasons were largely ascribed to the cost and effort required in preparing and presenting national reports. It was agreed that more effort needs be taken to encourage and assist potential signatories, particularly small states.

IAEA explained that they are in the process of developing safety standards documents on a common framework for radioactive waste management. This will pull out principles and requirements common to all radioactive waste types, to be supported by subsidiary documents addressing specific waste types. In the panel discussion there were complaints that the guidance should be more sensitive to the economics and practicalities of smaller countries.

Interest in regional repositories appears to be growing—a number of geographical groupings of small countries (for whom there are major economic benefits) are discussing the potential. Whether any single country will be prepared to act as ‘host’ remains to be seen.

Intermediate depth disposal and boreholes are approaches to waste management which are increasingly being recognised and pursued as clear alternatives to the near surface and geological disposal options. Disposal at depths of up to 100 m offers potential advantages over near surface disposal in being less sensitive to surface processes, including human intrusion, and greater predictability. Compared to geological disposal advantages are ease of characterisation and reduced costs. Work to develop cavern facilities in Japan, Cuba and France was described. Further guidance on such facilities was called for.

Boreholes are a further option for intermediate depth disposal, and are attractive for disused sources. There is a successful collaborative work underway in Africa, supported by IAEA; boreholes for spent source disposal are to be developed in a number of African countries.

A session on near-surface disposal addressed problems with managing NORM wastes, particularly large scale mine and mill tailings. There is general acceptance that some of these (Canada, Germany) will require institutional control in perpetuity. It was pointed out that local residents are generally less concerned with NORM wastes than with wastes produced in nuclear facilities.

In a session addressing the reassessment of disposal facilities, papers covered the reassessment of Drigg and risk management approaches at the Hungarian repository at Puspokszilagy. In the panel discussion a range of views were expressed on standards that should be applied to historical disposals, particularly if disposals are continuing on the same site. It was acknowledged as a difficult area, and one in which national approaches will vary. There was general acceptance that a good safety assessment has to be the foundation for consideration of optimisation and risk management for historical disposals, and that a structured approach using MADA or similar to inform decision making is important.

With regard to disposal safety cases, there was recognition that firm criteria are difficult to apply to very long time periods. There is also a wide range of views on what is meant by long time periods, and what criteria are appropriate. It was accepted that further effort to harmonise approaches would be beneficial. There was a warning that, given the long timescales for development of safety cases, having regulators work closely with implementors could lead to lack of independence. Well documented processes are needed to help avoid this. The need for waste disposal regulators to be independent and adequately funded was stressed.

In a session on stakeholder involvement it was acknowledged that there have been major developments in recent years. Papers in the session covered work in the US, Canada and Sweden. There was considerable common ground in these—a recognition that communication needs be clear; adequate time allowed for stakeholder involvement; roles and processes clear to all; and recognition that risk perceptions are important.

In discussion it was stated that the public supporting lines of argument will generally outweigh the central technical case in terms of
importance. Documentation should be minimised. The regulator should be seen as a neutral advocate of the public.

The acceptability of a repository was described as a ‘doughnut effect’; acceptance in the immediate locality and some distance from the site, but with an intermediate zone where there is some reluctance. Compensation of those affected is beneficial. The most successful compensation schemes seem to be those which do not have a sharp geographical cut-off. Other successful practices cited were the establishment of visitors’ centres and good web-sites.

There were interesting site visits to the Tokaimura 1 gas-cooled reactor and to Rokkasho Mura fuel cycle plant. Tokai 1 is currently undergoing decommissioning. Power generation ended in 1998 and the site is due to be cleared by 2018. We were told that the length of the (limited) care and maintenance period had been chosen to allow dose rates to reduce to the point where doses to decommissioning workers would be comparable to doses to workers during the operational period. Dismantling of the reactor core will be largely done remotely using a robot arm. Fuel element sleeve graphite is being incinerated in an adjacent waste management facility without gaseous abatement. No decisions have yet been taken on what will be done with graphite blocks from the reactor core (these will have a much higher C-14 inventory). Incineration with abatement to capture C-14 will be considered.

Rokkasho is a major fuel cycle plant that plays a major role in Japan’s development of a complete domestic nuclear fuel cycle industry. Commercial scale enrichment and fuel fabrication take place on the site. A commercial scale reprocessing plant has recently been constructed and approval has recently been given for the development of a MOX plant (to be operational from 2012). We visited the LLW receipt facilities, the near-surface disposal facility, an exploratory cavern constructed for an intermediate depth repository, and the returned vitrified HLW storage building.

Overall, an interesting conference, and a fascinating insight into waste management in a country having a major commitment to nuclear energy.

David Bennett
Environment Agency

KONTEC 2005
Berlin, Germany, April 2005

KONTEC 2005 was the 7th International Symposium in this series and was entitled ‘Conditioning of Radioactive Operational & Decommissioning Wastes’. The conference was held in Berlin and was well attended with a total of 571 delegates from 12 countries. Welcoming delegates to the conference, Dr Komorowski (Federal Ministry for Education and Research) gave a brief overview of radioactive waste management in Germany. He commented on the frustrations and difficulties caused by the lack of disposal facilities and with current uncertainties regarding the requirements and lifetimes for interim storage. However, these difficulties aside, approximately a third of Germany’s defunct nuclear plant had been decommissioned to date.

The conference included four plenary sessions, a large poster session and a substantial technical exhibition. The scope of material was wide-ranging and encompassed the following: waste treatment technologies (e.g. drying, encapsulation, incineration, supercompaction), metal melting and recycling (including free release considerations), dismantling of reactor cores, regulatory arrangements, clearance and delicensing of sites. The following is a brief summary of some of the more notable papers.

Walter Heep presented an overview of the design and operation of the ZWILAG facility (Würenlingen, Switzerland). Here a waste incinerator utilising a water cooled plasma torch with an operating temperature of up to 5000 °C is used to incinerate wastes, particularly burnable organic-rich wastes for which massive volume reductions can be achieved (e.g. by factors of 6–20). An elaborate off-gas system is required and the design that has been adopted is sufficient to ensure that strict Swiss air quality requirements are satisfied. It is noted that this technology offers potential benefits, not only in terms of volume reduction, but also in terms of the removal of organic materials that may be a cause for concern from a waste disposability perspective. However, the process is very energy intensive and one delegate (a proponent of supercompaction) suggested that it could be viewed as ‘taking a hammer to crack a nut’.

The Studsvik facility (Sweden) utilises a shot blasting technique to remove surface contamination from metallic objects facilitating either free or restricted release of the metal for reuse. Activation products that may be left behind are typically short-lived (e.g. 60Co) and may be eliminated by decay storage (e.g. 30 year timescales). Large and small objects and a range of morphologies can be readily treated. The shot is reused and the surface material (and hence the bulk of the radioactive contamination) is returned to the customer as waste. The surface decontaminated metal is then melted and the resulting products (metal ingots) are sentenced and either put into storage (i.e. decay storage), released to the metals market or returned
to the customer. Typically processing of stainless steel results in the release of 95% of the steel for eventual (or immediate) reuse.

A number of presentations described the remediation of contaminated sites. One presentation described the rehabilitation of the groundwater saturated zone in the course of dismantling a former fuel element factory. Essentially this described the remediation of contaminated sites. One presentation focused on the remediation and contaminations were categorised, versus ‘guiding values’ which were derived on the basis of background uranium concentrations and groundwater flow. Generally the top 50 cm of soil was removed in contaminated areas, but in places much deeper removal was required (to 8 m max). Soil that had been removed was characterised using a conveyor belt system with integral gamma scanner. Contaminated soil was removed by boring using a large sleeve tube, transferred to a landfill and replaced.

Further presentations covered the decommissioning of experimental reactor cores in Germany. Purpose built and often elaborate, remote cutting devices were engineered specifically in each case. A variety of cutting techniques were employed, including the use of diamond rope saws, plasma torches and conventional milling, drilling and grinding. The resultant wastes were packaged into containers for interim storage, with a strong emphasis on ensuring the maximal packaging density.

A number of presentations focused on the treatment of cement/concrete materials and the current state of knowledge with regards to the leachability and distribution of radionuclides in such materials as may arise during decommissioning. By understanding the distribution and mobility of radionuclides treatment methods are being designed to optimise the reuse of such materials by efficient, selective removal of the contamination. Contamination of building materials arising as demolition rubble during decommissioning is often limited to the surface/near surface of the materials, with the bulk being uncontaminated and potentially reusable. The intention is to free release as much of such material as possible, and to minimise the volume of material that has to be handled as waste.

One notable presentation described how standard mineral processing techniques were being applied to segregate contaminated rubble, thus facilitating the separation of the more highly contaminated fraction from the bulk and hence reducing the quantity of material to be declared and treated as waste. A processing system had been developed to crush and size segregate decommissioning rubble, with magnetic separation facilities for those wastes containing iron-rich materials. The system had shown great potential to date and the aim was to further develop the process for widespread application to decommissioning operations.

KONTEC 2005 provided a useful, technical summary of the advances that are being made in the field of the treatment and conditioning of radioactive waste, particularly in Europe. The impression provided was that of a ‘can do’ approach/culture, with a willingness to develop sophisticated techniques as and when required and with an emphasis on getting on with the job. Many of the presenters emphasised that public money was being spent on these projects and it was clear that there was a strong requirement to demonstrate progress and deliver results. This willingness to tackle difficult problems appeared to be supported by the close co-operation and enabling approach of the relevant regulatory bodies.

Paul Abraitis
Environment Agency

Third International Symposium, ‘Chronic Radiation Exposure: Biological and Health Effects’

Chelyabinsk, Russia, 24–26 October 2005

Within the Chelyabinsk Region in the Southern Urals of Russia are to be found the sites of some of the high level radiation exposures experienced by large groups of people that are at present the subject of intense epidemiological study. These groups include the workers of the Mayak nuclear complex that produced the plutonium for the first atomic bomb exploded by the USSR, and people living in the surrounding communities that were exposed to routine and accidental discharges from Mayak, especially those living close to the Techa River that received highly radioactive liquid effluent during the early years of operations at Mayak and those living in the path of the plume generated by an explosion in 1957 in one of the radioactive waste tanks at the site. The symposium held at Chelyabinsk in October 2005 was organised by the Urals Research Center for Radiation Medicine (URCRM), supported by various Russian organisations, the European Commission and the World Health Organisation, and concentrated on what is known about chronic exposure to ionising radiation as opposed to the acute conditions that pertained during the atomic bombings of Japan and during radiotherapy. Prominent among the evidence considered by the papers presented at the
The symposium covered a range of pertinent subjects: radiobiological effects of small doses, somatic and hereditary stochastic effects of chronic exposure, effects on biota and ecosystems, and, importantly, retrospective dosimetry (including biodosimetry). There was a recognition in the USSR soon after the exposures were received of the need to study their effects upon those exposed—in fact, the symposium marked the 50th anniversary of the establishment of URCRM. However, it is only in the past dozen years or so that the work of the various institutes in Russia has become publicly available in the West and open to scientific scrutiny. Substantial sums of money have been invested by, in particular, the USA and the EU to support the research within Russia and to provide assistance to the various groups of scientists through collaborations with researchers from the West having considerable experience in the relevant fields. The symposium provided an opportunity for those from Russia and the West to present reports of progress in the various studies.

It is quite clear that the potential information to flow from those groups exposed during the nuclear weapons programme of the USSR is great. However, realising this potential is easier said than done. As in all epidemiological studies, subjects need to be unambiguously identified and then followed-up to establish vital status, cause of death, cancer registration, etc. This follow-up should be as comprehensive as possible to avoid the possible introduction of biases. Then there is the question of a suitable comparison group with which the exposed group should be compared—if data for the exposed group are more complete than expected nationally then comparison with national rates could be misleading. There was considerable evidence at the conference that these fundamental issues have been given the attention they deserve and are being tackled seriously. Of substantial importance in radiation epidemiology are the doses received by the study subjects, particularly if risk coefficients (risks per unit dose received) are to be generated for comparison with those obtained from other exposure situations. (In this respect, the attention paid to the individual doses received by the Japanese atomic bomb survivors is illuminating.) The retrospective assessment of doses received half a century ago is no easy matter; but the informed estimation of these doses is vital if the maximum value is to be extracted from the various study groups. Of course, for workers there will usually be available some external dose records, although these records need to be carefully interpreted. Of greater difficulty are the doses received by workers from the intake of radionuclides such as plutonium; urinalysis or autopsy data may be available, but the derivation of organ and tissue doses from these data is not straightforward. Then there is the matter of doses received by members of the public. Doses received by those living close to the Techa River, for example, will obviously depend upon the quantities of short-lived fission products released into the river (i.e. for how long the irradiated fuel rods were ‘cooled’ before reprocessing and for how long the highly active raffinate was stored before release), and this may not be known with particular accuracy. There are techniques that can help such as those addressing the ‘memory’ of exposure of building bricks, and biodosimetry (for example, the levels of stable chromosome aberrations) may be of particular value here. However, it was apparent from the presentations at the symposium that there is still some way to go before there is confidence in dose assessments, and hence in risk coefficients.

What was clear from the symposium is that persistent and substantial collaborative effort is required to make serious inroads into the problems presented by the studies of those exposed in the USSR. However, the prize is potentially great and well worth the effort. Provided the challenges are not underestimated and the researchers are in for the long haul there is hope that, with the continued support of the West, reliable risk estimates will be obtained from the studies (with due attention being paid the uncertainties that will inevitably remain). It was encouraging to find that these challenges were being realistically and enthusiastically grasped by those presenting papers at this symposium in Chelyabinsk.

Richard Wakeford