PANEL SESSION 055: **International Deep Repository Progress**

Session Co-Chairs: **Anthony Banford**, *National Nuclear Laboratory (UK)*
Abraham Van Luik, *US DOE*

Panel Reporter: **Steven Thomson**, *UK NNL*

Panelists:

- **Gerald Ouzounian**, *Director, Direction International, Andra (France)*
- **Monica Hammarstrom**, *Director of Technology Department, SKB (Sweden)*
- **Thilo von Berlepsch**, *Head of International Cooperation Department, DBE Technology GmbH (Germany)*
- **Irina Gaus**, *RD&D coordinator, Nagra (Switzerland)*
- **Peter Lock**, *Health, Safety, Security and Environmental Director, Radioactive Waste Management Limited, (United Kingdom).*

Summary of Presentations:

Co-chair (1) opened the session and mentioned that despite the fact that progress towards a repository in the USA had been terminated in 2010 other countries around the world, primarily in Europe, have been making some good progress. Co-chair (2) then invited the first speaker Mr. Ozounian, to deliver his presentation on progress towards a repository in France.

Gerald Ouzounian provided a detailed overview of the progress made so far, and plans for future years. Highlights included the commissioning of 15 years of research in 1991, looking into the alternative options for disposal. The results of the technical studies carried out resulted in the publication of a new planning act in 2006, based on the results achieved. The primary consideration is always the safety of the population and protection of the environment. It is also expected that the useful part of used fuel will continue to be recycled via reprocessing, to allow it to be re-used, and that a technology will be developed to allow reversible geological disposal to be carried out.

It was explained that the process followed in France started in 1992 when 30 candidate sites were investigated, leading to 8 potential sites being suggested to the French government. Eventually a single site was selected, and an underground laboratory was licenced in 1998. The final facility will consist of a single underground vault and two ground level facilities. The underground vault will be surrounded in clay, and the ground level facilities will consist of one immediately above the vault, and another a distance away with the ability to transfer waste into the vault via a 4-5 km sloping underground tunnel.

It is proposed that vitrified HLW from used fuel reprocessing operations will be transferred into the repository without any additional over-packing, as it is felt that the current containers are suitable, and that the clay will provide a sufficient underground barrier. Robots will be used to manipulate the HLW containers.

Recent changes to the repository strategy include the addition of a pilot operations phase, long-term visibility and regular update of the repository master plan. It has been agreed that more involvement from the public will be encouraged in the future, and that clarification of

the timescales involved with the provision of the repository will be provided. The current plan is that the final planning application for the repository will be submitted in 2017, with construction underway in 2020 and the pilot facility available for operations to begin in 2025.

The next presentation, given by **Monica Hammarstrom**, included a description of the licencing process for the repository planned in Sweden, at Forsmark, which will be accompanied by an encapsulation plant to package the waste. Three separate licences are required, one for the repository, a second for the encapsulation plant and a third for the operation of the full disposal system as a whole.

Details of the history of the progress made to date were presented, some highlights being the start of the Aspo Hard Rock Lab in 1995, and the starting of the Canister Lab in 1998. Site investigation for the final repository for the spent nuclear fuel was carried out at two sites between 2002 and 2009. The planning application for the Encapsulation plant was submitted in 2006, and Forsmark was selected as the repository location in 2009.

In 2011 the licencing process was started, and this has led to 277 request for either further explanation or additional information up to March 2013. The most significant review comments included questions about site selection, as it is close to existing power plants and there is likelihood of regional groundwater flow. Questions have also been raised regarding long-term canister integrity, and environmental issues such as discharge to surrounding water sources, ecological impacts on local wildlife and noise impacts due to large scale industrial operations taking place. Submissions have also been made to Environmental Courts in Sweden in recent years.

The current licencing schedule was presented, and the requirements of technical developments proposed with the Finish repository project, under a collaboration with Posiva Oy, were briefly discussed.

The next Panel member, **Thilo von Berlepsch**, discussed progress with the German repository programme. It was mentioned that not much visible progress has been made in recent years, but that a great deal of progress has been made behind the scenes. There are 4 different projects already underway, each of which is at a different stage in its lifetime.

The Asse mine has been used as a repository for a number of years, but is full and a decision has been made to recover the waste from this facility for disposal elsewhere. The Gorleben facility contains heat generating waste and consists of boreholes drilled in 1980/81. Part of this facility is to be backfilled as is, with the remainder maintained to allow ongoing monitoring and access.

The Konrad facility is used to store non-heat generating waste. It was originally an Iron Ore mine, but the quality of ore was poor hence it was suggested for use as a repository when a licence application was made in 1982. This repository is scheduled to be refurbished.

The Morsleben facility in Eastern Germany was originally a huge salt mine which has seen a number of uses over the years, including use as a munitions store and for hen fattening! More recently it was given approval for use as a LLW repository in 1971. It is full and was due for closure, however regulations have changed and work is ongoing to upgrade this facility to make it fit for closure.

Selection of a site for a new HLW repository is due to get underway in 2015 and consultations with interested/suitable regions are getting underway. Decision on suitable sites for geological assessment are due in 2023, with site selection expected by 2031.

The next Panellist was **Irina Gaus**, who discussed progress with the Swiss repository programme. HLW and long-lived ILW will be disposed of in an HLW repository, with LLW and other ILW due to be placed into a low level waste repository. NAGRA, the organization responsible for progressing delivery of the repositories, consists of 100 people. It has been decided that the repository will be preceded by a pilot plant demonstration facility.

Feasibility studies for the ILW and HLW facilities were completed in 1998 and 2006, respectively. It is expected that the site selection process, which started in 2008, will be completed by 2027. A 20-30 year programme is in place covering the investigation, construction and then onset of operations. A Sectoral plan has been published which contains the rules that will be followed in the site selection process.

One of the problems with selecting a location for the Swiss facility is that there will always be people living close by, and this will most likely lead to public unhappiness in the area selected. Six areas have been pre-selected, only 3 of which are considered suitable for HLW disposal. Public meetings have been held in all of these locations in order to try to appease any public concerns.

A decision on 2 possible sites for each repository is expected from the Federal Council in 2017, with the expectation that a site will be chosen for each facility thereafter. The option of both the ILW and HLW facility being at a single location has not been ruled out.

The final Panel member, **Peter Lock**, represented RWML in the UK, and provided an update on progress made towards the provision of a UK repository which is to be used for the storage of ILW and HLW waste, alongside spent fuel, Pu and U. It was mentioned that from 2001 to 2008 all possible options for disposal were considered, which included firing the waste into the sun, but the final conclusion was that geological disposal was the best option.

In 2013 a vote was held in the UK where West Cumbrian local authorities, the larger Cumbrian County Council and the UK government all had a say in whether the investigation of the preferred site in West Cumbria should proceed. Local authority and government approval was given, but Cumbria County Council voted against the further investigations taking place so the process was stopped at this stage.

In 2014 geological disposal was re-confirmed as the preferred option and an enabling document was published setting out the process that will be followed. It was previously felt that RWML had not been given enough opportunity to publicise the positive aspects of the repository location to the local residents, so provision for this has been included this time around.

The key requirements for selection of a site for the repository are suitable geology and a willing community. RWML are also looking to learn lessons from other repositories around the globe, such as those discussed above and WIPP in the USA. A significant focus is also being placed on the disposal of high hazard wastes. The current plan includes a 2 year "cooling off period where preparations will be made for the next stage of the process. This next stage will begin in 2016, and will be a 15-20 year period of time where consultations

will take place to confirm interested areas within the UK. Information on the proposed repository will be made available, and investments will be made in local areas as the process progresses. This will then be followed by a 100+ year design, build and operation phase, once a site has been selected.

The UK government is currently in the process of changing the laws with regards to a repository being judged to be of national significance so government will lead on the planning decision making process. However, there will still be a requirement to test public support, with no work started until this has been received. All areas of the UK now have the opportunity to express an interest in housing the repository.

Questions:

A question was raised from the audience with regards to the process for selecting what packaging will be accepted for use in the repository in the UK. Panellist Lock indicated that RWML are advising on the packaging that should be used, but they do not have overall authority on this. RWML are overseen by the UK regulator, Office of Nuclear Regulation (ONR), who will have the final say on the suitability of packaging to be used. A member of ONR who was in the audience confirmed that this was the case, but they would make sure that RWML were fully consulted as part of this process.

A further question was raised to Panellist Lock with regards to the fact that it has been stated that local and regional authorities in the UK should be able to prevent the participation of other members of that community. Peter Lock re-iterated that although this was indeed the case, public support will still be required for the repository to go ahead on any location in the form of a test public opinion. A follow up question was raised with regards to whether a change of government in the UK would alter the new repository selection process, and Peter indicated that he did not expect anything to change.

Panellist Hammarstrom raised a question to panellist Lock regarding whether Cumbria was the only location being considered for the UK repository. Peter Lock indicated that all areas in the UK will have the opportunity to show an interest in housing the repository. Peter also indicated that part of the reason for the current 2 year pause was to make it clear to other regions that this was the case.

A question was raised regarding confirmation of the reversible nature of the storage of the waste in the French repository. Panellist Gerald Ouzounian indicated that it must be demonstrated that recovery of the disposed waste is possible, as the main reason for this constraint is to mitigate against the possibility that the disposal process may not be successful. The Panellist also pointed out that risks to safety are being considered and that remote methods are being considered to monitor the temperature, pressure and other aspects with the repository, in case any unforeseen issues occur.

A member of the audience from US DOE then asked if any of the panel members had considered asking communities if they would like to host the repository, or whether a reverse auction had been considered. It was mentioned that members of the public around WIPP had shown positive interest in housing the facility. Panel member Irina Gaus indicated that when the offer of financial incentives had been offered in Switzerland members of the public had been offended by this offer.

A member of the audience from IAEA then asked the Panel members who had made significant progress towards a repository what they would recommend to countries just starting the process now, or in the future. Panellist Hammarstrom indicated that she would recommend that the concerns of the people in the local areas are understood, and leave it up to them to decide. Panellist Ozounian indicated that lots of lessons had been learned in France, including that it is important to have support at a national level before embarking upon the process. It is also important to work with locals to understand their concerns, and collaboration with other countries is important to ensure that progress is made as efficiently as possible.

A general question was then raised regarding the fact that the Panellists had all indicated what was being planned in the long term, with less focus on what is being doing now and in the near term. Panellist Ozuonian indicated that it is important that long term plans are in place and well communicated as the next generation will have to carry out the recovery and disposal of the waste. It was also mentioned by various panellists that long term knowledge management was required as part of the long-term plans, as this is something that has not been done well in the past on other projects. Plans to do this effectively must be laid out and started in the short term.

A further question was raised to PanellistHammarstrom, this time asking how long those responsible for building and operating the facility should continue to listen to the public. Monica Hammarstrom indicated that we should listen to the public all the way through the process. A follow-up question was raised that this means that the public could change their minds near the end of the process, and this would not be sensible. Claes Thegerstrom, who was present in the audience and had been heavily involved in the selection of the Swedish repository location, was asked to contribute and he indicated that the power of veto should only be in place up until a certain point, then the decision cannot be reversed.

A member of the audience from South Africa then asked a series of questions, first of all regarding the requirements in France to meet the licence submission by 2025. Panellist Ozounian confirmed that the final licence submission will be carried out in 2017, with the pilot facility available for 2025. The next question was with regards to what the Panel would recommend the first steps would be, and how important mining experience is in providing an underground repository. Panellist von Berlepsch responded that he thought that the mining experience in South Africa would be important in building a repository, and that the nuclear experience in South Africa, albeit limited compared to other countries, would also be important. Panellist Gaus indicated that the safety case for the repository would define the requirements, and then you know what to do to build the repository. Panellist Lock agreed that mining experience would be very useful in enacting the provision of the repository, and that it would be beneficial to work with other countries to find out lessons learned which would help accelerate progress.

Conclusion:

It is difficult to make an overall conclusion given the diverse nature of the repositories either in place or in progress around the globe. However it is clear the public consultation and engagement is key in ensuring that a successful outcome is achieved. Lessons learned in various countries were discussed during the Panel session and it is important that this process continues into the future, not just at conferences such as Waste Management Symposia, but

as often as possible between different countries. This will help ensure that both technical issues and socio-economic challenges are understood and solved as quickly as possible, in a cost effective manner.