

## WM2016 Conference Panel Report

**PANEL SESSION 113:**      **Experience of Records, Knowledge and Memory (RK&M) for Nuclear Waste Geologic Repositories.**

**Co-Chairs:**                      **Russell Patterson**, *Compliance Certification Manager, DOE/CBFO*  
**Tom Klein**, *Scientist IV, AECOM Technical Services, EPA Compliance Programs*

**Panel Reporter:**                **Robert Watson**, *Scientist I, AECOM Technical Services, EPA Compliance*

### **Panelists**

1. **Claudio Pescatore**, *Private Practice Consultant (France)*
2. **Abraham Van Luik**, *Physical Scientist, DOE/CBFO*
3. **Stephan Hotzel**, *Technical Expert – Physicist, GRS gGmbH (Germany)*
4. **Thomas Peake**, *Director, Center for Waste Management and Regulations, EPA/ORIA*

Approximately 40 people attended this session which focused on establishing international guidelines for the design and content of messages to the future being developed by various repository programs around the world. The session began with a presentation given by each panelist including a question and answer period immediately following each presentation. The session ended with an extended question answer period. The question and answer periods covered topics such as soft storage, repository symbol standardization, evaluation criteria for the efficacy of Passive Institutional Controls (PICs), the relationship between knowledge and understanding, competency requirements for future generations who interact with PICs, and deliberate oral history.

### **Summary of Presentations**

**Abraham Van Luik** focused on the idea that the United States is not alone in the pursuit of long term memory preservation. All of the speakers from the Wednesday RK&M session looked beyond the radioactive waste community for help. There have been new developments in durable media in Japan, the UK and Denmark. Japan developed the “Laser-glyph,” a storage medium three times harder than quartz with a lifetime of several thousand years. The UK is developing a technology featuring Nano-structures in glass capable of storing 360 terabytes of data for 13.8 billion years. The Dutch are developing the “Million Year Worm,” a “write-once-read-many-times” storage device readable with current computer or smartphone technology with a lifespan of one million years. He reiterated a need for a Key Information File (KIF) for repositories which would be utilized by local Land Use Control authorities.

## WM2016 Conference Panel Report

**Stephan Hotzel** spoke about the OECD NEA International Initiative to establish international guidelines for RK&M at geologic repositories for nuclear waste. They are working to deliver advanced insights on RK&M and to identify potential gaps in our knowledge. The initiative is building an RK&M “tool box” through a number of deliverables including studies, reports, scholarly papers, an RK&M Bibliography and an RK&M Glossary. The bibliography would be most useful for individuals and organizations outside the project. The Glossary would be more project-related. The Initiative includes 20 organizations from 13 countries. Current topics being addressed include a “Set of Essential Records,” and the KIF. The deliverables will roll out in two phases lasting through 2018. The most appropriate path forward beyond 2018 will need to be discussed.

**Tom Peake** spoke about the regulatory approach to long term memory preservation in regards to geologic disposal in the United States. The population characteristics around a repository site change how information is viewed. He explained EPA’s generally applicable standards for spent fuel, high level waste and TRU waste in terms of memory preservation. Memory preservation can deter systematic or persistent exploration of sites, or inadvertent intrusion. DOE is required to inform EPA about PICs plans. EPA encourages review and revision of the original plans. Could the information be held at the generator sites? How could information be applied over a continuum of technology? Assume the future presence of regulatory institutions; plan for their absence. How should population characteristics be considered for near, medium and long term memory needs?

**Claudio Pescatore** began by posing the question, “Should we walk away when a long-term technical project is done?” “Should we allow forgetfulness?” Information can be lost with a change of responsibilities. International agreements say we should preserve the memory of all nuclear waste repository sites. Implementers are proactive in RK&M but regulators rarely are. There is a difference between “oversight” and “built-in-controls.” Oversight by man is watchful care. It is society “keeping an eye on” the repository. There should be no intention to forgo oversight, however, there should be contingency in place in case oversight is lost. We should think about the future in three distinct periods; direct oversight, indirect oversight, and no oversight. It is vital to involve the communities. There is much more work to be done.

### **Question and Answer**

In response to an audience question as to whether “soft storage,” i.e. folk stories and metaphors (metaphoric long-term storage) has been looked into, **Abraham Van Luik** explained about research into universal symbols for danger and markings for repositories. **Claudio Pescatore** added that it is very important for the repository to become a part of the local cultural heritage. Something like a dual time capsule could create a ritual in the community and become part of the cultural lore. **Abraham Van Luik** spoke of a proposed museum in Carlsbad, New Mexico,

## WM2016 Conference Panel Report

celebrating the community's role as part of the "Manhattan Project" cleanup. **Tom Klein** noted the local community must want it to be a part of their cultural heritage. **Stephan Hotzel** then said it can be dangerous to rely on metaphors due to their tendency to change in meaning over time.

**Stephan Hotzel** was asked how the efficacy of RK&M plans is evaluated. Is there a standardized criterion? How is agreement reached on what is enough? He replied that we are still working on what could and should be done. It is not the time for us to decide those things. There is much discussion that must first take place. One should take costs into account. **Tom Peake** added it is important to have a plan. EPA requires DOE to have a plan. The plan can change over time, but it is important to have that plan in place.

A statement was made that you can't make decisions now which will last thousands of years. Things will change. Knowledge does not equal understanding. **Tom Klein** replied that is why we should consider an Artificial Intelligence system that could adapt to constant change. **Abraham Van Luik** added that is why the NEA is creating a toolbox. We have moved away from saying "danger," toward saying, "here are the facts." We have an obligation to inform the future. **Claudio Pescatore** then explained that we have to identify which tools will reinforce one another so that some of them will survive.

The panel was asked what kind of competency would be required to use the tools we are developing. **Abraham Van Luik** responded that the KIF will be designed to be read by an individual with a high school education level. The other more detailed files will be in a more technical language, but the file used the most will be in plain language.

In response to a follow-up question inquiring if we should use pictures for a future where no one knows our languages, **Abraham Van Luik** replied, one picture can mean different things to different people. You cannot rely on your intuition. At some point we have to just give it to the future.

An idea was presented that we should use a system of "story-tellers" and dedicated scribes to propagate the repository information forward into the future, similar to the way religion has done it; we have to consider society's tendency to become distracted. **Abe Van Luik** replied that repositories do not even come close to the kind of importance to society as religion does. Story telling is not the way to propagate information into the future. Is the risk posed by a repository really that great? **Stephan Hotzel** added that information about repositories should be taught in schools at least locally. Pictograms would cater to a different audience and situation entirely. They are used when there is an uncertainty of which language will be understood. However, historically, mankind has not become more stupid. **Claudio Pescatore** explained the solution should be proportionate to the problem. We should try to add value to our community. Retaining the memory is an ethical consideration. There are plenty of avenues for preserving memories.

## WM2016 Conference Panel Report

For example, in England there are battle reenactments and reenactments of lore and history. **Stephan Hotzel** replied it is not a good idea to use a one-size-fits all approach. **Tom Peake** added that you must consider your audience now and in the future. We have limited resources. How can we best utilize these limited resources?

All participants agreed that more discussion on this topic needs to occur at future conferences and meeting.