

## WASTE MANAGEMENT CONFERENCE

# Forty years of meeting the global challenges of waste management

**H**istory and Mother Nature combined to boost attendance at the 2014 Waste Management Conference (WM2014), held March 2–6 in Phoenix, Ariz. In the case of the former, the conference marked its 40th anniversary with a record number of papers and panel presentations. But it was the latter, in the form of the infamous “polar vortex,” that may have caused the Arizona weather to be the bigger draw. Despite below-average temperatures and a rare (and much-needed) rainfall the day before the conference officially opened, the relatively mild weather was a welcome respite from the brutal winter weather that many of the attendees from more northerly regions had been suffering through for the past four months.

The comfortable weather did not keep attendees away from the Phoenix Convention Center, where the meeting’s 127 technical sessions and panel discussions were well attended. The exhibit hall was also well populated, at least after 5 p.m., when the meetings were finished and food and drink were brought out.

The opening plenary session of WM2014 provided attendees an opportunity to hear about the approach to radioactive waste management taken by the two nations that are perhaps closest to establishing final repositories for spent nuclear fuel, Sweden and Finland. The Swedish Nuclear Fuel and Waste Management Company (SKB) submitted license applications for a repository and encapsulation plant in the spring of 2011, while Finland’s Posiva Oy submitted

*WM Symposia’s 40th annual Waste Management Conference provided a look at Sweden’s and Finland’s approach to waste management and an update on the environmental cleanup in the United States.*

its construction license application for the Olkiluoto repository in 2012.

Christopher Eckerberg, president of SKB, started off the session by providing an overview of the Swedish method of handling spent nuclear fuel. Called the KBS-3 method, it is based on direct disposal of the fuel after about 40 years of interim storage. At the heart of the method, Eckerberg said, is KBS-3’s copper canister that contains the spent fuel and will be placed in bentonite clay below about 450 meters (about 1,475 feet) of crystalline bedrock.

Eckerberg also reviewed the process used for selecting the repository site at Forsmark, which was chosen as the preferred site in 2009. The site selection process, he said, went through three primary stages: knowledge accumulation, feasibility studies, and detailed site investigations. Eckerberg stressed that community participation in the entire process was voluntary. “Essentially, public consultation and dialogue is probably the main success factor for our technical progress,” he said.

In addition to strong public involvement and close cooperation with communities, Eckerberg noted that other factors contributing to the success of Sweden’s waste

management program include the clear responsibility the country’s nuclear industry has for implementing and financing the program, a scientific and engineering approach that relies on international cooperation, and the oversight of a trustworthy regulator. One of the great challenges that SKB and Sweden face, however, is the licensing of a first-of-its-kind facility, Eckerberg said. Industrializing—going from theory to practice—poses quality control challenges, he said, adding that SKB’s test and research facilities are key to mitigating these challenges.

Turning to Sweden’s neighbor Finland, Tiina Jalonen, senior vice president of development for Posiva Oy, spoke about the country’s nuclear program and its experience developing the Olkiluoto deep geologic disposal facility. As in Sweden, Finland’s nuclear industry is responsible for the management of the waste it produces. Jalonen said that a 1994 amendment to Finland’s Nuclear Energy Act requires that all nuclear waste produced in the country remain in Finland.

According to Jalonen, the selection of Olkiluoto as the site for a deep geologic repository was accepted in a decision-making

process that ran from 1999 to 2001. Based on that decision, which was ratified by the Finnish parliament, an underground rock characterization facility called Onkalo was constructed. Jalonen said that Onkalo has aided in the collection of data needed for the construction license application for the Olkiluoto repository, which Posiva Oy submitted to the government in 2012. Posiva Oy anticipates that it will receive license approval to begin construction in 2015, with plans to commence disposal operations in 2022, according to Jalonen.

For Finland, Jalonen said, moving forward to close the back end of the nuclear fuel cycle is the right thing to do. "We don't want to leave the burden to future generations," she said. "It is up to us to solve the problem."

Presenting the views of suppliers, John Lehew, a senior vice president for CH2M Hill, spoke about safety and the safety culture that cuts across all of the decommissioning projects managed by the U.S. Department of Energy's Office of Environmental Management (EM). According to Lehew, the partnerships forged not only between the DOE and its contracting companies but also with the industry's workforce and the international community have substantially advanced the safety culture.

In looking at the evolution of the nuclear safety culture, Lehew noted the dramatic shift during the late 1980s and early 1990s, when DOE sites went from a mission of weapons production to decontamination and decommissioning (D&D). This led to



Lehew

based safety initiatives, according to Lehew. "Workers come up with some of the best ideas," he said. As an example, Lehew said that a worker at the DOE's Hanford Site came up with the idea of using wheeled golf bag carts to transport heavy handheld radiation detection equipment around the site during the characterization of a large section of land, helping prevent fatigue and injuries.

By engaging workers and small-business contractors, Lehew said, the DOE and its principal contractors are learning better assay and characterization techniques, as well as better decontamination methods, all of which reduce workers' handling of hazardous waste materials.

While the conference was celebrating its 40th anniversary, EM was celebrating its 25th anniversary. EM's accomplishments were highlighted by the panel's final speaker, David Huizenga, EM's acting assistant secretary. Before launching into the DOE's



Huizenga

achievements, however, Huizenga provided the audience with an update on the situation at the Waste Isolation Pilot Plant (WIPP) in New Mexico, which less than four weeks earlier had an emergency involving an underground truck fire, followed by an accidental radiological release nine days after that (*NN*, Apr. 2014, pp. 59 and 17).

According to Huizenga, the incidents at the transuranic waste repository were completely unrelated, and any exposures resulting from the release of radioactive materials from the facility were extremely low. At that time, Huizenga said, the cause of the release had not been determined, and DOE and WIPP personnel were still working on reentering the mine. (For an update, see p. 48, this issue.)

Turning to EM's progress since 1989, Huizenga pointed out that there were 107 contaminated sites in 35 states to be cleaned up when the program started. Today, there are 16 sites in 11 states. "We made a significant reduction in our footprint," he said. Despite the progress, Huizenga said, the DOE estimates that it has over \$200 billion in "to-go costs" before its cleanup mission is completed, which is expected by 2060.

In looking at the history of EM, Huizenga broke down the program's timeline into

three eras. During the first era, from the program's inception to around 1994, EM focused on site characterization and risk management, negotiating agreements with stakeholders and regulators and beginning waste tank operations and other early cleanup activities. During the second era, from 1995 to 1999, EM made measurable progress, Huizenga said, including the closure of the Pinellas Plant in Florida and the opening of WIPP. Huizenga also said that during this time, the decision was made to close additional DOE sites to reduce the on-site costs of storing nuclear waste.

During the final era, starting in 2000 and running up to the present day, significant progress has been made in site cleanup and closure, Huizenga said. Cleanup activities were greatly accelerated during this era with the help of the American Recovery and Reinvestment Act of 2009, which provided over \$6 billion in additional funding for the EM program.

Huizenga said that in addition to its cleanup accomplishments, one of EM's greatest achievements is its safety record. "We're committed to a safety-first culture," he said.

## EM hot topics

Matthew Moury, EM's deputy assistant secretary for Safety, Security, and Quality Programs, took up the subject of safety during the session titled "Hot Topics in U.S. DOE Environmental Management." Moury



Moury

said that EM has some of the best safety metrics, despite the hazardous nature of the work it does, and it continues to focus on improving its safety culture. Moury said that EM met or exceeded all of its safety metrics in 2013.

According to Moury, EM's organizational culture, its safety culture, and its safety-conscious work environment are all interdependent. For 2014, Moury said EM is going to focus on the Integrated Safety Management System, which will undergo an annual review to assess the system's effectiveness.

Melody Bell, EM assistant secretary for Human Capital and Corporate Services, provided a look at EM's talent acquisition and succession planning strategies. The workforce issues that EM faces, she said, include budgetary challenges and an aging workforce. Being able to maintain a workforce with the right balance of skills is critical to continuing EM's work, Bell said. "EM is not going away. We do have a very urgent and long-term mission," she said.

The steps EM is taking to recruit and maintain its workforce include identifying

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the development in 1996 of the Integrated Safety Management System, which provided a framework for safety and environmental work performance. Since then, he said, advances in technology, methods, and equipment have improved the safety of working conditions.

Today, key elements of a strong safety culture are worker involvement and employee-

a strategic direction across the DOE to align its workforce needs, Bell said. This includes talking to project managers and directors to identify their needs. Furthermore, Bell said that a key recruitment tool EM uses is simply demonstrating the important work the DOE is doing while treating people as its greatest asset.

Mark Gilbertson, EM deputy assistant secretary for Site Restoration, next talked about EM's budget. Gilbertson was filling in for Terry Tyborowski, EM's deputy assistant secretary for Program Planning and Budget, who was in Washington, D.C., working



Gilbertson

on the fiscal year 2015 budget rollout. While the recently passed FY 2014 budget returns EM to its baseline funding following the phasing out of American Recovery and Reinvestment Act funding, Gilbertson said that the passage of the new budget showed a vote of confidence by Congress in the work EM is doing. The reduced funding, however, disproportionately affects the progress of cleanup work, as EM's site maintenance costs are fixed, he said.

Later in the session, Gilbertson discussed EM's progress in site restoration work. He said that EM is relying heavily on technology development to help restore sites, such as the recent development of a phosphor paint that can detect technetium-99 contamination.

Jack Surash, EM deputy assistant secretary for Acquisition and Project Management, outlined EM's performance goals and strategies. Surash said that for the coming year, EM was going to focus on assessing the office's staffing level and workforce skills, while also improving its acquisition planning and the management of DOE contracts. "We're definitely moving in the right direction as we try to do this as fast as we can," he said.

Christine Gelles, EM associate deputy assistant secretary for Waste Management, returned to the subject of WIPP, providing more details on the events at the plant than were given by Huizenga during the plenary session. In particular, Gelles noted that the two incidents, the truck fire and the radiological release, occurred more than 2,300 feet apart in the salt mine. The truck fire was in the north part of the mine, while the air monitor alarm indicated that the release originated near Panel 7



Gelles

in the mine's waste disposal area, Gelles said, adding that Panel 7 was open to receiving waste at the time of the release.

On the subject of commercial disposal facilities, Gelles said that the DOE is reevaluating its policy of using commercial facilities to dispose of its radioactive waste only if it can be proven to be cost-effective, as there may be other factors that would make the use of a commercial facility preferable. Currently, the DOE's preference is to dispose of waste at the site where it was generated or at another DOE-owned site.

Finally, Ken Picha, EM acting deputy assistant secretary for Tank Waste and Nuclear Materials Management, reviewed progress made by the DOE in recovering and treating its tank wastes. Picha highlighted the DOE's strategic framework, released in September 2013, for addressing the 56 million gallons of tank waste at the Hanford Site near Richland, Wash., where technical issues with the site's Waste Treatment and Immobilization Plant have delayed progress.

**Hanford tank AY-102**

Hanford's high-level waste tanks were further discussed at a session devoted to the condition of the site's AY-102 tank, a double-shell tank that was discovered to be leaking waste into the annulus space between the inner and outer tank shells. The speakers covered the extent of the tank's condition, as well as Hanford's double-shell tank integrity program and the DOE's plan for pumping waste from the leaking tank.

### Hanford tank AY-102

The AY-102 tank was first discovered to be leaking in August 2012, when material was found in certain areas inside the annulus during a routine visual inspection. The first step in assessing the leak was to take samples of the material to verify whether it indeed was waste from inside the primary shell or other material that had migrated into the annulus from outside the tank, said Terry Sams, project manager for DOE contractor Washington River Protection Solutions (WRPS). This was the first time that material sampling had been performed within the annulus of a Hanford double-shell tank, Sams said, and the tight confines of the annulus (there is a two-foot gap between the tank shells) made the task difficult.

In order to get the samples, WRPS and its subcontractor, AREVA, modified existing commercial robotic equipment. Sams said that they used a modified auger attached to a robotic vehicle, which was able to pull small samples of the materials into a collec-

tion bin. Lab analyses identified some of the material as most likely being waste from the primary tank. A small mound of brown material found in one area, however, turned out to be soil that is thought to have fallen into the annulus during maintenance work on the tank.

Crystal Girardot, also of WRPS, said that a formal leak assessment of AY-102 in October 2012 concluded that the primary tank is in fact leaking. Girardot said that WRPS began enhanced visual inspections of the tank, monitoring changes to the annulus on a set schedule. According to Girardot, since the inspections began, no significant changes have been observed, with only small accumulations of additional material found at two locations. WRPS has since said that additional waste material has been found at a third location in the annulus (*NN*, Apr. 2014, p. 62).

The leak was most likely caused by a breach of the primary liner due to pitting corrosion, said Kayle Boomer, also of WRPS, who conducted a corrosion evaluation of the AY-102 tank shell. While the increased concentration of corrosive wastes threatens the liner, Boomer said that waste samples suggest that the pH is favorable for slowing down corrosion and that the secondary shell should remain intact for years, not months.

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Michelle Hendrickson, an engineer with the Washington State Department of Ecology, said that the tank cannot be repaired and needs to be pumped out and closed. Hendrickson noted that the tank's ventilation has not worked properly for almost seven years, the waste chemistry has been out of specification since 1999, and the tank is 17 years past its design life. "Progress has been made, but there is still much to do," she said.

### International safety

The subject of safety culture was revisited during an international panel session on safety culture in waste management and D&D. Simon Carroll, senior analyst with the Swedish Radiation Safety Authority (SSM), began the session with an overview of Sweden's approach to developing a strong safety culture.

The challenge Sweden faces, Carroll said, is the overall scale and intensity of the changes necessary to develop a defined safety culture within a new regulatory organization. Formed in 2008, SSM is a young agency and is currently revising its nuclear regulations with the intent to develop specific safety requirements. "We don't actually have a formal set of criteria for evaluating safety culture in Sweden," Carroll said.

Sweden also has limited experience in nuclear D&D, Carroll said, so SSM is developing awareness of potential challenges and looking for particular lessons learned and issues the regulator and its licensees may face. "We're very interested in looking at the experiences of other countries," he said.

Mark Rouse, managing director for Dounreay Site Restoration in the United Kingdom, stressed the role of leadership in



Rouse

achieving a strong safety culture. Consistency is important in leadership, Rouse said, as is rewarding people by giving them the knowledge and skills necessary to meet safety targets. You can either penalize your workers, creating a straitjacket to

make them do what you want, or give them

the tools to be successful, he said.

Kulvinder McDonald, of the U.K. Office for Nuclear Regulation, echoed the importance of leadership in safety culture. Leaders set the tone for safety, she said, adding that creating a D&D culture where people follow a mantra of "the way we do things around here" can lead to a robust safety culture.

The challenge of adhering to a strong safety culture in D&D work is that decommissioning is different from steady-state nuclear plant operations, McDonald said. In decommissioning, there is continual change within the work environment, with different risks and hazards and more reliance on administrative controls.

Educating and engaging workers is an effective way to shape nuclear safety and quality, said Melinda D'Ouille, nuclear safety and quality culture project manager at Bechtel National. According to D'Ouille, one way Bechtel is cultivating a learning organization is by regularly "taking the pulse" of its employees, gathering their opinions through surveys, polls, and scorecards. These feedback tools provide coaching and learning opportunities, she said.

Julie Goeckner, an EM senior advisor on nuclear safety culture, and Diane Sieracki, senior safety culture program manager for the Nuclear Regulatory Commission, provided U.S. regulators' view of safety culture.

Goeckner, who admitted that the DOE



Goeckner

could do more to build a robust safety culture, said that issues raised at the Waste Treatment and Immobilization Plant at the Hanford Site resulted in the DOE's developing an action plan to strengthen its safety culture. Some

of the ways the DOE is measuring its safety culture, Goeckner said, are through individual safety culture assessments, town hall meetings, validation and effectiveness reviews, and benchmarking with other federal agencies.

Sieracki said that since the NRC is purely a regulator and not an operator agency like the DOE, the NRC's approach to safety culture is more "hands off" than the DOE's. The NRC's safety culture policy statement, published in 2011, covers all NRC licensees, she said.

The NRC does, however, conduct safety outreach and education efforts, Sieracki noted. These include interactions with licensees and stakeholders, international involvement, conferences and training, and educational tools such as publications and case studies.—*Tim Gregoire, Editor, Radwaste Solutions*