Waste Management 2001

A rainy week in Tucson made for a conference filled with lively presentations and stimulating discussion.

It was a rainy week in Tucson for the Waste Management 2001 conference, but that made the actual conference that much better. Not tempted by the nearby golf courses and pools, the 2000 or so meeting registrants crowded into technical sessions and the exhibit, making for lively presentations and stimulating discussion.

The Kickoff

For a little while, the plenary session of this year's Waste Management conference (held February 25–March 1 in Tucson) resembled a 1950s movie theatre, with audience members wearing cardboard 3-D glasses to watch the three-dimensional kickoff presentation by Keith Wayne, of Washington Group International (WGI).

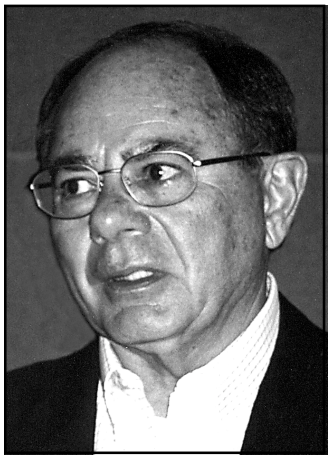
Silly glasses aside, Wayne reminded attendees of the recent reemergence of nuclear energy as a viable energy source (as the California energy crisis continues and oil and natural gas prices remain high). But the nuclear future remains tied to the issues of nuclear waste, he said, and the waste management/cleanup industry is being pressured to do its work faster, better, and cheaper, without compromising safety.

Retired University of Pittsburgh professor Bernard Cohen addressed the issue of a probabilistic risk assessment (PRA) for a waste repository that the public can understand. He suggested that instead of trying to prove the viability of a repository at the proposed site at Yucca Mountain, the U.S. Department of Energy should conduct a PRA for an "average" (randomly selected) U.S. site. Once the risks are defined for such an average site, he said, it should be easy to prove that a specific site should be at least as safe as a randomly selected site.

However, he cautioned, the final risk numbers, generally expressed in terms of number of deaths per year extending out into the future, may be predicting deaths from diseases that will be completely curable in 100 or 500 years. For example, he said, the cancers we predict for 500 years from now may well be curable then. Therefore, he suggested, instead of spending up to $400 million per life

saved in the future, perhaps that money should be placed in trust, allowing future generations to make decisions on how to save the lives.

Closing the plenary session was Beverly Cook, manager of the Idaho National Engineering and Environmental Laboratory (INEEL), speaking on how people deal with technology developments. There is a benefit of living in this time in human history, she noted. Many of us can remember when things were very different: We can remember life without televisions, without computers, without global communications. Thus, we can bring insights to the issue of new technologies and their effects on people.



John Bradburne

Generally, she said, there are two ways people deal with new technologies: full immersion or full denial. Most of us are somewhere in between these two alternatives, she noted. We use new things for convenience, because they offer increased quality or increased performance, or because new technologies are the only way we can get the job done at all.

In the area of nuclear waste cleanup, new technologies can help us solve many of the trickiest problems but can also increase public distrust of our efforts. Thus, she said, we must look closely at what technologies we really need, adapt them for new uses, and work on developing greater public trust.

As an example of a new enabling technology at INEEL, Cook described the use of "fabric" buildings erected over a construction site at the lab, which allowed construction work to continue throughout the winter and thus helped keep the work on schedule.

Site Closure

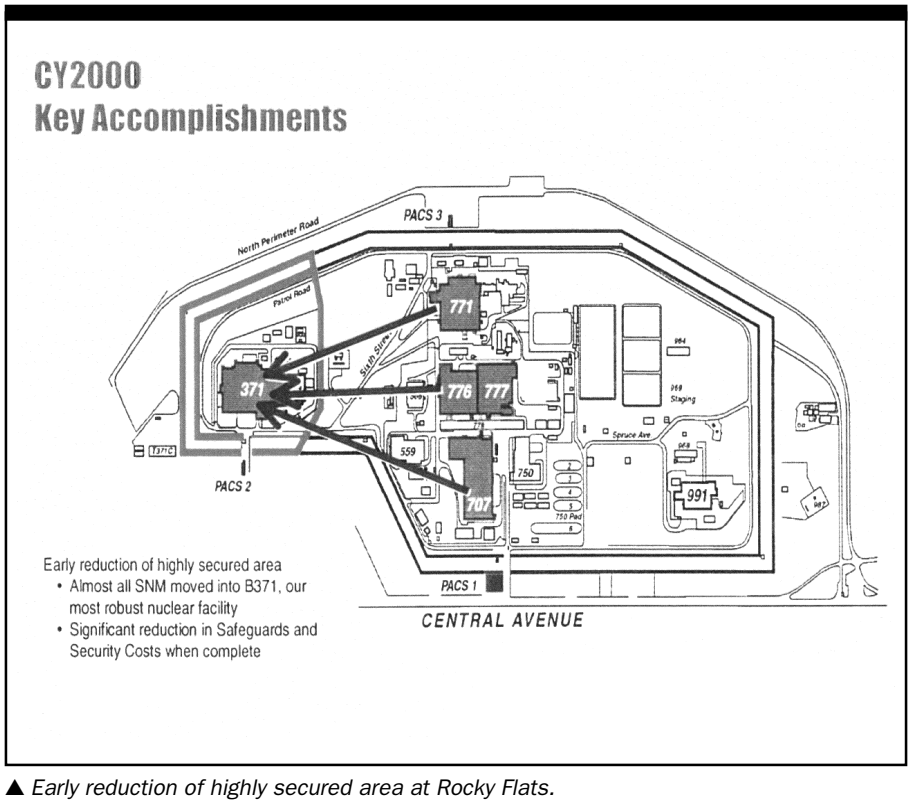
During a Tuesday session on closure progress at DOE cleanup sites, the department's Jim Fiore reported on the closure status for many of the smaller sites with 2006 closure goals. In general, things are moving well, he said. The DOE's vision for site closure is to set the standard for safe operations, he said, and, indeed, safety performance is improving, with lost-time accidents down. And, he continued, the DOE's increased focus on safety first means that the agency is prepared to remove contractors if operations are not conducted safely.

The larger issues still to be resolved in site closure include post-closure liability, staffing needs, and new technologies and cost savings. With regard to post-closure liability, Fiore said that the role of DOE headquarters is to provide guidance but that the field offices have been given greater flexibility to deal with the sites under their jurisdiction. Manpower requirements remain a key issue at closing sites, with specialized skills needed. The DOE may have to pull people from other sites to deliver the right skills at the right time. This means that the DOE must study its compensation and incentive packages to keep key people at sites for the right amount of time. Once again, he said, the DOE is allowing the field offices increased flexibility in this area.

In the wake of impending budget cuts, the DOE is working across its sites to achieve cost savings. One method is to combine waste from different sites into single shipments to obtain a better shipment price. Also, the DOE is increasingly putting the savings gained back into projects, helping to bring closure dates forward.

Randy Scott, from the DOE's Office of Science and Technology, discussed new technologies. During the past decade, he stated, more than 1000 new technologies were deployed, with more than 200 in the last year. The majority of these new technologies have a moderate-to-high potential for reducing worker hazards. And in the future, he said, workers will be involved earlier in the technology evaluation process.

John Bradburne, president and CEO of Fluor Fernald, the contractor doing the cleanup work at the Fernald site, reported on the new contract recently issued by the DOE. In the wake of flat funding and schedule refinements, the contract specifies an outside closure date of December 2010, several years beyond the previously announced 2006 closure goal. However, Bradburn said, the company is looking to bring the date in (to 2008) and the costs



▲ *Early reduction of highly secured area at Rocky Flats.*

down. "Stay tuned," he concluded.

Nancy Tuor, vice president of Strategic Planning and Integration with Kaiser-Hill, the Rocky Flats contractor, reported that the company has an internal closure goal of December 15, 2005. One key to that goal is the site's success in shipping transuranic waste to the Waste Isolation Pilot Plant (WIPP). The site is currently sending three shipments a week to WIPP and plans to increase that number to seven per week later in the year. Rocky Flats is WIPP's biggest shipper right now, she said.

Another goal for this year is reducing the size of the protected area at the site. Over the July 4 weekend, Tuor reported, the fence will come down, and the protected area will be reduced to a small area around Building 371 (see graphic on previous page). Thus, workers will no longer need Q clearances to enter most areas. Whether this results in increased efficiency is not yet known, she concluded.

Utility Decommissioning

Several utilities decommissioning nuclear plants are looking forward to fuel movement in the next few months. This progress was reported at the Wednesday morning session on nuclear reactor decommissioning.

Mike Terrell, with Duke Engineering, reported that Yankee Rowe expects to begin to move fuel this spring. He also said that the 1995 decommissioning cost estimate of about $407 million has been revised up to about $453 million.

Rancho Seco also expects to begin fuel movement as early as April 2001, John Newey, with NewRad Inc., informed the session. The first canister was placed in the fuel pool in mid-February. The canister was electropolished first to make decontamination easier after each transfer, Newey said.

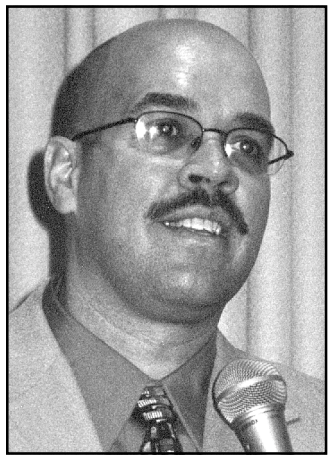
After fuel is moved, Newey continued, planned work for 2002 includes dismantling the pool, processing pool water and discharging it, and completing work on the remaining systems in the reactor building, except for the major components. The original cost estimate for the decommissioning work of $460 will have to be revised, he said, since much of that has already been spent while waiting for fuel movement.

Keith Spooner, from BNFL, reported on decommissioning work at the Trawsfynydd plant in Wales, which was shut down in 1993. The U.K.'s generic decommissioning strategy calls for defueling after shutdown, then care and maintenance preparatory work, and, finally, a care and maintenance stage that will last up to 100 years. Thus, dismantlement work is not scheduled to begin until between 2089 and 2096, Spooner said. Intermediate-level waste (ILW) is currently being stored underground in buildings on the site, but Spooner said that they may not be able to make a safety case for keeping the waste there (the waste is stored near the water table), so they may have to build new interim storage facilities.

In the meantime, since the plant is located in a national park, work is progressing to reduce the visual impact of the plant. This involves lowering the roof of the reactor building at least 21 meters and selectively planting trees (already started) to shield the building from view.

An audience member commented that the U.K.'s strategy of a 100-year wait until dismantlement and decommissioning was "very disappointing." He noted that people will conclude that the industry does not know how to do this work. But Spooner responded that the decision was dependent on the fact that there is currently no final ILW repository in the United Kingdom.

Bill O'Dell, with Maine Yankee, noted that the utility is about 35 percent into its decommissioning and that the coming year is considered the "hump" year at the site. They hope to get the reactor vessel out this year, with the first dry storage casks scheduled to arrive onsite in early spring and contractors already onsite to move spent fuel. If Maine Yankee gets through this year on schedule and on budget, he said, the utility will feel pretty good. On the budget issue, he reported that the original $360 million decommissioning budget has been increased to about $500 million.



Harry Boston

Big Rock Point also expects to move fuel sometime between this coming fall and the summer of 2002, stated Scott Dam, with BNFL Inc. The reactor vessel is expected to be ready for shipment to Barnwell in the fall of 2002.

The Path Forward at Hanford

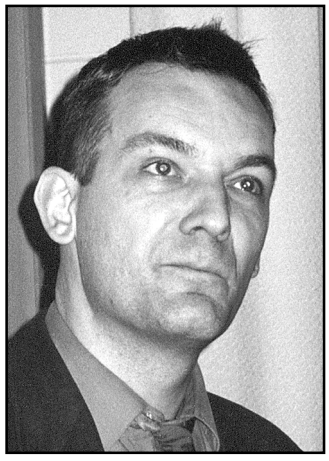
Harry Boston, manager of the DOE Office of River Protection (ORP), could not contain his enthusiasm about the new Bechtel National Inc./WGI contract for Hanford tank waste vitrification. Speaking to a packed session on Monday, Boston confidently stated that "we are now positioned to move forward." And moving forward is essential, he said. "If we don't get the waste out of the tanks and processed, we will have to start building new tanks, at a cost of some $60 million to $100 million each. And if we wait, the old tanks will start leaking again."

The job ahead is the "largest, most complex cleanup job in the United States," Boston continued. But, he said, "we know how to do this." *Operability* of the Waste Treatment Plant is the key to success, he added. "I am not interested in getting a waste treatment facility delivered to me. Rather, I am interested in getting the waste treatment work *done*."

In Boston's view, it's the good people on a project that will get the job done. "I wanted the best people around for this job, and I think I have that in Ron Naventi and Bill Poulson and their people on the project team."

Also speaking at the session was Neil Brown, a division director at ORP. Brown briefly discussed the "unacceptably conservative" business approach and the management deficiencies that ultimately caused the scuttling last June of the previous vitrification contract between the DOE and BNFL Inc. But Brown's primary topic was the technical issues in the new contract. For the most part, he said, the contract preserves the good facility design developed earlier. A few

of the necessary technologies must still be studied further and refined, he concluded, including cesium and technetium removal and high-level waste vitrification.



Jan Verstricht

Fran DeLozier, president of the CH2M Hill Hanford Group (CHG), noted that her company really benefited from its seven-month responsibility for the treatment plant technology development (between the time that the BNFL contract was canceled and the Bechtel/Washington contract was signed). "We gained a new appreciation of treatment needs," she stated, and that has "really improved the teaming efforts" CHG is making with the Project Team.

Also, CHG is operating under a new agreement—a six-year, $2.2 billion contract just concluded with the DOE in January. Under this contract, CHG has responsibility for increasing the safety of the tank farms and delivering the tank wastes to the vitrification plant. As part of the safety work, DeLozier stated, the company plans to reduce the risks around the single-shell tanks by removing the liquids and reducing the mobile radionuclides in those tanks. And she proudly pointed to successes achieved over the past few years in tank safety, including the elimination of the problems with the "burping" tank and the "boiling" tank. Of the original 60 tanks on the 1990 tank "watch list," only 24 remain, and the safety issues on those tanks will be closed out this calendar year, she said.

The session closed with comments from Suzanne Dahl, from the Washington Department of Ecology. She noted just some of the reasons why Ecology supports the vitrification project: the 1.5 million people living downstream of Hanford; the 1 million gallons of tank waste that has leaked, some of it reaching the groundwater; 30 million gal of waste remaining in old single-shell tanks; and the greater costs of doing nothing. If we do nothing, she said, within 100 years there will be new environmental impacts, and within 300 years contamination levels in area drinking water will be several times the safe drinking water standard. To prevent any further problems, Ecology expects the DOE and its contractors to meet the schedules in the contract, she said. "The Northwest can be patient no longer."

Alain Sneyers

Around the World

A Monday afternoon session on national perspectives provided some light on waste programs in various countries around the world.

Suzanne Dahl

Jan Verstricht, with CEN/SCK in Belgium, reported on that country's efforts to study geological disposal in clay. The country is engaged in cooperative study of the technology with France, Spain, and Switzerland, which are also interested in the clay medium.

Alain Sneyers, also from CEN/SCK, reported later in the session that Belgium expects to license a repository by around 2025 and to have construction completed by 2035.

Ingo Beckmerhagen, with BfS in Germany, noted that after the latest German elections, one thing that *didn't* change in that country was the fact that near-surface or shallow-land waste disposal is not allowed. Thus, all waste is buried in deep geological formations. The country has focused on old salt or iron ore mines for disposal or for disposal studies. The Asse salt mine was operated as a low-level waste and ILW storage site between 1965 and 1978. The Morsleben salt mine in the former East Germany operated as a storage site between 1971 and 1998, but the new government closed it. The Konrad iron ore mine had been studied between 1976 and 1989, with no action taken since then. In addition, the new government halted studies at the Gorleben mine for at least 10 years. The government is now looking at other sites for a single repository for all waste types, although it has not completely ruled out the Gorleben site for this purpose.

Rebecca Longsworth, with SAIC, presented information about the DOE's Office of Environmental Management (EM) international programs. She highlighted cooperative efforts in Russia, Poland, and Argentina, where various projects are being conducted. For example, Russian technology is being deployed at Oak Ridge to clean out the gunite tanks; a phytoremedia-tion project in Poland is working to remediate lead-contaminated soils; and several decontamination and decommissioning projects are in progress in Argentina. EM also has programs with the United Kingdom, Japan, Canada, France, and Ukraine, she said.

Danielle Dosaru, from Romania, reported that her country's current waste priority is to construct a dry spent-fuel storage facility at the Cernavoda nuclear plant site. Longer term projects include development of a near-surface disposal/repository for LLW and short-lived ILW. However, as far as a repository for long-lived ILW and spent fuel is concerned, she said, the country is adopting a "wait and see" attitude.

It's "unreasonable" to expect every small country with a nuclear power program to build a repository for HLW and spent fuel, stated Mike Lawrence, from the Pacific Northwest National Laboratory. Thus, he said, some sort of international nuclear disposal is an "inevitability." Indeed, he stated, the original Atoms for Peace program envisioned an international agency to take over nuclear waste. Current proposals for international storage include the Pangea plan for Australia (which is decidedly cool to the idea) and a possible site in Russia.

Rebecca Longsworth

Mining the Waste

Any waste that can be *put into* an underground repository can be *removed* from that repository—if you're willing to spend the money. That was the consensus of speakers at a Tuesday afternoon session on monitoring and retrievability of waste buried in deep geologic repositories.

The session began with a presentation by Jacques Grupa, from the Netherlands, representing a European Union study group that looked at the retrievability question. After a year of meetings, the group developed the following definition of retrievability: "The ability, provided by the repository system, to retrieve waste packages for whatever reason retrieval might be wanted." Grupa stated that the final clause—"for whatever reason retrieval might be wanted"—took the political issues off the table, so that the study could focus solely on technical issues.

Grupa noted that the working group defined six distinct "time zones" in a working repository lifetime:

1. Backfill and seal disposal cell.
2. Backfill and seal depositing tunnel.
3. Backfill and seal access tunnel.
4. Backfill and seal shafts.
5. End institutional controls.
6. Waste has decayed.

The difficulty and cost of retrievability increases as each new time zone is achieved.

The working group looked at several aspects of retrievability:

- Design—Retrievability can be implemented in the design stage, making retrieval easier and extending the time zones.
- Safety—Design modes should not increase hazards, although extending time zones increases operational risks.
- Sociopolitical aspects—Retrievability allows a staged decision process (wherein decisions are reversible to a point) and gives future generations more options (which seems more "ethically correct," Grupa said).
- Monitoring—A two-pronged process is involved: monitoring for compliance with regulations and for assurance that the waste stays retrievable.
- Safeguards—These must still be formulated.

Grupa concluded by noting that retrievability has several advantages:

1. Safety and operational aspects—allows intervention if something goes wrong.
2. Licensing aspects—allows a staged decision process.
3. Societal—allows future generations more authority.
4. Waste management—allows more control and surveillance.
5. Public acceptance—allows key decisions to be reversed.

Mark Matthews, from the DOE, presented results from the 1992 demonstration of retrievability at WIPP. This demonstration proved that retrieving the waste at WIPP would be possible even after the salt has closed in, by means of a small-scale mining operation. Thus, he said, waste removal is possible, but by no means cheap. (This concept of "mining" the waste was also mentioned by other speakers in the session.) In addition, removal operations can be hazardous to workers, potentially exposing them to radioactivity, hazardous constituents, gas, brine, and rock instability.

Kirk Lachman, also from the DOE, noted that as part of its licensing effort, the proposed Yucca Mountain repository must also prove that waste can be retrieved up to a certain point; retrievability up to 50 years after placement is part of the regulatory requirements, he said. However, the repository design will allow for removal only during the preclosure period (which could last as long as 300 years). After closure, the drifts will not be accessible. The DOE has done no demonstrations of retrievability yet, but Lachman said the agency may have to do one later.

Speakers from various European countries provided other insights into the retrievability question. Eric Biurrun, from Germany, noted that to Germans "disposal" means "final." After closure of a repository, retrieval is not intended. Therefore, one idea is for temporary disposal in a separate "retrieval mine," which could remain open for up to 100 years after closure. Christer Svemar, from Sweden, gave some additional reasons to consider retrievability:

- Another (possibly better) method of disposal might become available.
- Reuse of spent fuel is of interest.
- The repository might not perform as planned.

In Sweden, he added, retrieval requires a license, so you need a license to bury it, he said, and another license to dig it back up.

Brendan Breen, from U.K. Nirex, said that the U.K.'s plan for phased disposal allows options to retrieve the waste or close the repository at several stages. But, he noted, if retrievability is an objective, then disposal may not be a real option.

In the audience discussion phase, several audience members and speakers alike questioned the ethics behind emphasizing retrievability. As one person noted, "We are potentially exposing workers to grave risks just to satisfy some vague public concerns. Is that a fair tradeoff?"—*Nancy J. Zacha, Editor* ■