A Report from the Third Annual RadWaste Summit, held September 8–11, 2009, in Las Vegas, Nev.

DU, Part 61, and a Host of Other Issues

The most exciting moments at the Third Annual RadWaste Summit, organized and sponsored by ExchangeMonitor Publications and Forums and held September 8–11 in Las Vegas, came during discussions of what to do about depleted uranium (DU)—the material left over after uranium has been enriched for use in nuclear fuel—and about the U.S. Nuclear Regulatory Commission's initiative to revisit low-level waste regulations in the *Code of Federal Regulations* Title 10, Part 61. In both cases, debate was lively and consensus was difficult to reach.

Revising Part 61

A little background is needed here to explain the history behind the NRC's initiative to revise—or risk-inform—Part 61. It all begins with DU, which was not a substance that commercial entities dealt with back when Part 61 was developed—all uranium enrichment was done under the auspices of the U.S. Department of Energy or its predecessor agencies. In Part 61, the NRC laid out detailed, isotope-specific lists of various types of LLWs and categorized them into Class A (lowest radiation levels), Class B (more radioactive), and Class C (the most radioactive LLW). Anything not listed was automatically considered Class A waste. [*Editor's note:* A separate category, greater-than-Class-C (GTCC) waste, primarily activated metals, has emerged; it is considered neither LLW nor quite high-level waste.]

Enter DU. Because it is not listed in Part 61, it is considered Class A waste. But there are many people who feel that it should be categorized higher, primarily because unlike other LLWs, its hazards do not decrease with time, but actually increase (because of radon). With this controversy in mind, the NRC has begun discussions on whether it should revise Part 61. In addition, the regulatory agency's efforts to "risk-inform" its regulations—to make them more compatible with the actual risk that its regulated materials have on public health and safety—put Part 61 in the spotlight, because its regulations on LLW are considered somewhat arbitrary and out of date.

With that background in mind, the conference organized a roundtable discussion, moderated by John Greeves, who used to direct the NRC's LLW office, on the NRC's re-examination of Part 61 and possible implications for existing licensees and agreement states.

Patrice Bubar, deputy director of the NRC's Division of Waste Management, introduced the topic by pointing out that the Part 61 initiative has the immediate goal of dealing with the DU from new commercial enrichment plants that will be entering operation in this country over the next several years and the long-term goal of risk-informing the LLW waste classifications. In its efforts, the

NRC will be looking at several sources of information, Bubar said, including advisory committee letters, National Council of Radiation Protection and Measurements Report 139, the National Academies low-activity waste (LAW) study from March 2006, International Atomic Energy Agency safety guides on waste classifications, incidental waste determinations, approaches by other countries, stakeholder input, and the DOE's years of experience.

Ruth McBurney, executive director of the Conference of Radiation Control Program Directors (CRCPD), outlined issues that the states are concerned with, including potential new dosimetry models, exempt levels (if any), impacts on existing disposal sites, unique waste streams that may require scenarios outside the compact system (she specifically mentioned terrorist act cleanup in this category), compatibility issues for agreement states, and engagement with the U.S. Environmental Protection Agency (EPA)—because any new classifications may affect LAW in landfills and because dose bases must be reconciled with EPA rules.

After these presentations, a wide-ranging discussion ensued among the panel, which included Martin Letourneau, from the DOE's Environmental Management (EM) Office of Compliance; William Dornsife, vice president of Waste Control Specialists (WCS, which operates the Texas Compact licensed waste disposal site); Steven Romano, chief executive officer (CEO) of American Ecology, which operates the Northwest Compact's LLW disposal facility; and Tom Magette, senior vice president of nuclear strategy for EnergySolutions, which operates the Class A LLW disposal site in Clive, Utah.

The discussion started with a question from the audience: "Just how radical should the NRC be in its efforts—or, do we even need the LLW classification system anymore?"

Letourneau was quick to jump in, stating that the "classification system has no relevance if you risk-inform the process." But Dornsife, representing the voice of caution throughout the debate, noted that there is always a risk in opening up a new rulemaking. "The current system works," he noted, and "it would be safer to stick with it." Yes, he acknowledged, the radiation standards are out of date, but that doesn't matter. Magette, however, took the opposite view. You have to "blow up" Part 61 to get it risk-informed. And, he continued, it doesn't make sense to apply it only to new sites.

Moderator John Greeves stated that opposition to the NRC effort is "not an option." The commission is "headed down the road to change," he said. We need a modern dose conversion factor, and the primary problem for the NRC is to work on the performance objectives; the waste classification system is secondary, Greeves said. In summary, he said, there "has to be a rulemaking." The question is, he concluded, will we be able to live with it?

Romano stressed the need to "keep it simple." He said he has a deep concern for rulemaking efforts without sufficient resources (Bubar admitted that any rulemaking effort on Part 61 will require more NRC resources), and he noted that it will not be easy to gain consensus on these issues—as the continuing debate proved. In his opinion, he said, "case-by-case rulings get the job done." He added that he doesn't want "to watch the BRC [below regulatory concern] movie again," particularly since it was a "bad movie to begin with." [*Editor's note:* Romano was referring to the NRC's failed effort in the 1990s to pass a regulation that declared that certain very low-level materials would be declared "below regulatory concern" and therefore would be considered unregulated.]

Greeves commented that "this country needs and deserves an exempt level—which may not necessarily be part of Part 61." Dornsife responded that "we don't have a BRC level, but material *is* being disposed in unlicensed facilities, on a case-by-case basis" and that "we don't want to mess with that." Greeves summed up the BRC discussion by noting that the EPA "has had this issue on the shelf for years," and it will take an EPA to bring it forward.

Romano also observed that in his opinion, Class C limits can't be overturned, because state laws are based on them. Greeves agreed that it could be disruptive to pull the classification system out.

Letourneau pointed out that under the DOE policy, looking at disposal impacts beyond 10 000 years "is not feasible." Dornsife responded that

Because DU is not listed in Part 61, it is considered Class A waste. But there are many people who feel that it should be categorized higher, primarily because unlike other LLWs, its hazards do not decrease with time, but actually increase.

The NRC's efforts to "risk-inform" its regulations—to make them more compatible with the actual risk that its regulated materials have on public health and safety—put Part 61 in the spotlight.

when WCS was working on the licensing for its disposal facility in Texas, they had to demonstrate that facility performance would be in compliance for 50 000 years. He asked if the NRC had "the guts" to put in a regulation that you don't have to go beyond 50 000 years, or even 10 000 years.

Speaking from the audience, the Nuclear Energy Institute's (NEI's) Ralph Andersen commented that "it's been said that if the NRC really does this, there will be no GTCC—that it will go away. That would save a *huge* amount of money and effort, he said.

Alan Pasternak, from the California Radioactive Materials Forum, brought the discussion back to the practical level by commenting "this is not the most important issue facing us today." What *is* important, Pasternak continued, is the fact that most of the activity being generated today cannot be disposed of because of the current disposal system. We need to focus on the more important problem of *disposal,* he said.

It's been said that if the NRC really does this, there will be no GTCC—that it will go away. That would save a huge amount of money and effort.

Focusing on DU

Many of the same comments could be heard again two days later during a roundtable discussion on "charting a risk-based disposal path" for DU. Panelists included David Esh, a senior systems performance analyst for the NRC; Christine Gelles, director of disposal operations for the DOE; Stephen Cowne, director of licensing and quality assurance for LES (which is building an enrichment plant in New Mexico); David Shrum, senior vice president of regulatory compliance for EnergySolutions; and William Dornsife, from WCS. John Greeves again acted as moderator.

Gelles noted that the DOE is an active generator of DU, most of which is disposed of at Clive. The DOE also has the responsibility to dispose of commercially generated DU, if asked to do so, she said.

Esh said the NRC's effort on the Part 61 rulemaking is intended to provide clear regulatory expectations and guidance. And, he noted, comparing DU to mill tailings and uranium in the ground, they don't want to set up a requirement for DU that "Mother Nature can't pass." The issues of concern are water and air pollution, he said.

Cowne began his comments by noting that the LES facility will be starting its first cascade for enrichment later this year. In his opinion, Cowne said, DUF_6 is an asset. It might not be quite as much of an asset in a gaseous diffusion plant, he explained, which uses a lot of electricity, but LES's centrifuge technology does not use as much electricity. LES also doesn't believe that a rulemaking is needed for safe disposal of DU, Cowne continued. And LES believes that DU, when not considered a resource, is properly characterized as a Class A LLW. If the DU classification is changed, he concluded, the costs will ultimately go to the electricity consumer.

There is always a risk in opening up a new rulemaking

Shrum said that EnergySolutions has been disposing of DU at Clive and wants to continue to do so. He noted that the NRC's recent guidance in SECY-08-0147 concluded that large quantities of DU could be disposed of in shallow-land burial facilities in arid locations.

Dornsife stated that he sees two issues with the DU controversy: *performance* and *implementation.* Discussing performance, he said it takes 50 000 years for DU to develop a hazard. It's kind of silly, he said, to do a performance assessment of a shallow-land burial system out to one million years. "There is a 100 percent probability that your uncertainty will be 100 percent," he stated. As for implementation, he said, we are "going to get different implementations in different agreement states," which will set up an unfair competitive environment.

In passing, Dornsife commented that WCS had to do a site stability analysis out to 50 000 years, dealing with such topics as erosion and climate change (rain, ice ages, aridity). "All bets are off if a glacier runs over your site," he said.

Speaking tongue-in-cheek, Dornsife suggested making DU disposal containers out of DU—"it would solve two problems at once." More seriously, he proposed classifying DU as Class C waste; that way, it would be buried deeper and would be encased in concrete containers. Or, he added, it could end up being classified as GTCC. Dornsife's "biggest fear" in changing Part 61, he concluded, is that it's embedded in federal and state laws, and state laws might be hard to change.

Asked during the audience question session on a timeline for the Part 61 initiative, Esh said that in October the agency will start the generation process for rulemaking documents. They will have about a year to do that and then will need another year for public comments. After that, he continued, it will be a couple more years for agreement states to make their modifications. He added that he figures that 80 percent of the parties to this process will be neutral or favorable. In the interim, disposal of DU is not now considered a public health or safety concern, and therefore the NRC does not feel any need to rush with the rulemaking.

Timing *is* important, however, for some parties to the discussion. Shrum noted that the Radiation Control Board in Utah has been asked to place a moratorium on DU disposal until the NRC's rulemaking is completed. The Utah regulator is against the moratorium, Shrum continued, but probably will not fight it if it is passed. [*Editor's Note:* See "Headlines," this

issue, page 10, for an update on this subject.] Dornsife added that once Texas heard about the NRC's DU rulemaking, they placed a 10 nanocurie-per-gram limit on DU for disposal.

New Options from Disposal Site Operators

A whole host of other LLW issues also received focus during the three-day summit. Most, of course, in one way or another addressed the major concern of the LLW community: the lack of disposal facilities for Class B and C wastes for most commercial LLW generators.

EnergySolutions

Jeff Gardner, vice president of Clive operations for EnergySolutions, reported on several new options his company is offering its clients. These include the following:

- Thermal Desorption, a process for the treatment of polychlorinated biphenyls and organics. Since its first approval in 2003, Gardner said, the process has treated more than a million pounds of sludge and oils, mostly for DOE customers.
- License Stewardship. This refers to the transfer of Exelon's Zion nuclear power plant license to EnergySolutions for decommissioning. Once the decommissioning process is completed, the license will revert to Exelon. The whole process has been put on hold because of the current economic slowdown, Gardner explained, but with the markets starting to come back, EnergySolutions hopes to get the project back on track.
- The Moab, Utah, Tailings Pile Cleanup. This contract was awarded in 2007, Gardner said. It involves cleanup of a 130-acre tailings pile containing some 15 million cubic yards of uranium mill tailings. EnergySolutions will clean up the pile and transport the tailings to a new disposal cell.
- Resin Solutions. This project has been under discussion for about a year, Gardner said. It involves treatment of ion exchange media so that they can be disposed of as Class A waste. Demonstrations are currently under way at the company's Bear Creek facility in Tennessee, Gardner said, and the company hopes to launch it commercially in late 2009 or early 2010.

In a community, Gardner concluded, you look for change together. The challenges are significant but not insurmountable.

Waste Control Specialists

Ron Baltzer, president of WCS, said his company is offering a "Texas solution" to the nuclear waste community. He said the WCS waste disposal facility in Texas is "nature's perfect disposal grounds," having no drinking water source in the area, no neighbors, and almost impermeable red clay formations.

The commercial LLW disposal facility in Andrews County, Texas, licensed by the Texas LLW Compact, is currently scheduled to open at the end of 2010, Baltzer said. Do you have to wait until then to send material to WCS? No, Baltzer asserted, because the facility has options for storage until disposal is available. In the meantime, the company is already working on initiatives to amend its license so that it can take containerized waste by rail (it can take such waste only by truck at the current time), take DUF_6, and take bulk soil (not containerized) as waste.

Discussing the often arcane subject of pricing, Baltzer noted that disposal pricing for commercial customers is formula-based and regulated by Texas law. For the disposal of federal wastes, however, the pricing is market based. And, he stated, at the direction of the Texas Compact Commission, the WCS facility *may* be a solution for the nation for Class B and C waste.

American Ecology

Steven Romano, CEO of American Ecology, noted that at the current time, options for LLW generators are extremely limited, and for generators in 34 states, there is no place to send Class B or C waste and only "monopolistic pricing" for Class A waste. Change is coming, however, he asserted. Some hazardous waste facilities (6 of 18 total in the United States) have been disposing of radwaste for some time. However, he said, "you don't hear much about it."

In the last five years, Romano continued, the U.S. Ecology Idaho disposal site, a facility regulated by the Resource Conservation and Recovery Act (RCRA), has disposed of some 1.7 million tons of hazardous waste and some 1.9 million tons of radioactive waste. The use of RCRA sites for radwaste disposal has NRC support, he said, and the RCRA sites that do take radwaste have robust disposal mechanisms. Going into detail, Romano said that RCRA facilities take mostly low-activity materials and can take any material *not* regulated under the Atomic Energy Act, including NORM (naturally occurring radioactive material), TENORM (technically enhanced NORM), and FUSRAP (Formerly Utilized Sites Remedial Action Program) materials, in addition to some regulated waste. However, RCRA facilities are limited to a radiation level of 3000 pCi/g throughout, Romano explained later.

We don't have a BRC level, but material is being disposed of in unlicensed facilities, on a case-by-case basis.

The future of LLW disposal includes increasing use of RCRA facilities, the potential availability of the WCS facility, and increased use of commercial facilities by the DOE, Romano said. And regulators need to look at these options using risk-based approaches, he added, and get away from the "pedigree" approach (where hospital and university waste is good, while fuel cycle–based waste is bad).

In conclusion, he said, we need "open, honest competition on a level playing field."

During the question period, all three presenters were asked if there is a need for more disposal sites in the United States. Gardner simply said, "Yes," while Baltzer noted that new sites can be very expensive to develop, so he thinks there will be

enough capacity at the current sites. Romano said he preferred to use the "hazardous waste model" and said we should let the market decide: market conditions will take care of it. Session moderator Ed Helminski, from ExchangeMonitor Publications and Forums, noted that at the current time, we don't *have* a free market, because the LLW compacts run the show. Romano replied that the compacts are evolving and could begin to work with the marketplace in the future.

Generator Viewpoints

Christine Gelles, director of disposal operations for the DOE, noted that right now the DOE is embarked upon the largest environmental cleanup effort in the world. The DOE's highest priorities are tank wastes; spent fuel storage, receipt, and disposition; special nuclear materials; and high-priority groundwater remediation. Lower priorities include transuranic waste disposal, soil/other groundwater remediation, and decontamination and decommissioning of excess facilities. More than half of the cleanup budget actually goes to maintaining minimum safe working conditions, she stated, while the rest goes to cleanup.

The $6 billion in stimulus money (from the American Recovery and Reinvestment Act) that the program has received will be focused on environmental management project completion and footprint reduction. The money will allow the DOE to accelerate 70 compliance milestones at 17 sites in 12 states, Gelles said. At the same time, however, the stimulus activities will put an additional strain on the treatment and disposal complex.

In the future, Gelles continued, the DOE will be disposing of more of its material at commercial sites. Indeed, the LLW disposal facility at the Nevada Test Site may go from the preferred site to the site of last resort, because "Nevada and Washington State do not want to be the sole repositories of DOE waste," she explained. As for commercial facilities asking for access to DOE sites, Gelles explained that in her opinion, the DOE has barely enough space to dispose of its own wastes. She is empathetic to the commercial waste generators, she said, but is not inclined to help.

In summary, she said, the DOE needs more disposal facilities, more flexibility, and more backup plans. Sometimes having a license and a good site is not the primary value of a site, she concluded, because "political reality interferes."

Ralph Andersen, director of Radiation Safety and Low-Level Waste for the NEI, noted that the commercial nuclear industry has "mentally adjusted to the Barnwell closure and is moving on." The past year has been a busy one, Andersen continued, with the industry facing such issues as DU, the licensing of the WCS site, problems with decommissioning funding, disposal of sealed sources, new reactor licensing contentions based on the lack of LLW disposal, and even the Sarbanes-Oxley Act, which requires utilities to set aside funds for LLW disposal (determining the amount to be set aside is a "guessing game" for utilities, Andersen said).

The $6 billion in stimulus money (from the American Recovery and Reinvestment Act) that the program has received will be focused on environmental management project completion and footprint reduction. The money will allow the DOE to accelerate 70 compliance milestones at 17 sites in 12 states.

Andersen addressed a new industry strategy on LLW that would coordinate activities of the NEI, the Electric Power Research Institute (EPRI), and the Institute for Nuclear Power Operations so that the industry can speak with one voice to stakeholders, Congress, the president, regulators, and so on. The group views would be vetted through working groups and endorsed by chief nuclear officers, he said.

Among the principles the industry would espouse are the following:

- States and compacts are key to enabling safe LLW management options.
- Open and competitive markets best facilitate the production of disposal options needed.
- A sound scientific and technical base is needed but is not enough. Political realities and economics must also be taken into account.
- Stakeholder views must be addressed.

In conclusion, he said, we are not facing a crisis, but "something must be done."

Responding to a question from Alan Pasternak on the Health Physics Society recommendation that Class B and C waste could go into a DOE GTCC facility, Andersen said that GTCC disposal is the statutory obligation of the DOE, while Class B and C waste disposal is the statutory obligation of states and compacts. Things change, however, he conceded, and a "national dialogue" could lead to such a change. A dialogue with Congress will probably also be necessary for any such change, he added.

Moderator Ed Helminski noted that he was part of an LLW "national strategy" in the 1978–1979 time frame (which led to the current compact system). The nation's governors are not prepared to tackle this, he said. If you are looking for a national strategy, you will need a small group of people from the National Institutes of Health (the "good guys") to initiate this, as opposed to the commercial nuclear power industry (the "bad guys"). The National Governors Association needs to address this, Helminski continued, and they will not do so unless the medical community demands it. It

takes leadership, and "we don't have it today."

Other Viewpoints

William Sinclair, deputy director of Utah's Department of Environmental Quality, looked at the issues facing a host state. The first issue, he said, is "Where's the equity?" If there is a disposal facility in one state, he said, all the other states feel that the problem is solved—I'll just send my stuff there—without considering the equity issue.

Another issue is the perception of being a national (or international) "dumping ground." States need to consider if such a facility creates a bad image for the state or discourages tourism and business development.

The third issue is the impact national initiatives have on the host state. Consider the NRC's initiative on Part 61, Sinclair said. Are we looking at reclassifying the Class A/Class B/Class C system because we need to update an outdated system or because we want to be able to send everything to Utah?

Finally, Sinclair said, there's the issue of the "burden" hosting a site has on a state. From the Utah perspective, there are costs associated with the state regulatory framework, the local regulatory framework, working with the compact system, and incident and response training, among others.

At a separate session, Sinclair addressed the recent litigation between EnergySolutions and the Northwest Compact over waste imports from Italy. According to Sinclair, the May 15 court ruling stated that the Northwest Compact does not have authority to restrict access to the Clive disposal site. The compact *can,* however, regulate LLW disposal in Clive, as well as in Richland, Wash. Sinclair said the Northwest Compact, the Rocky Mountain Compact, and the State of Utah have filed appeals to this ruling. In the meantime, Sinclair said, an offer from EnergySolutions to provide millions of dollars to the state and to limit any foreign waste disposal to 5 percent of the Clive site capacity "is still on the table." Former Utah Gov. Jon Huntsman (now ambassador to China) rejected the offer, and the new governor, Gary Herbert, has not made a decision, he said. This issue has generated a lot of public opinion in the state, Sinclair added.

Ruth McBurney, executive director of the CRCPD, pointed out that the lack of disposal options for Class B and C waste has led to a lot of volume reduction by waste generators, so that only abut 15 000 to 20 000 cubic feet of such waste is produced annually in the United States. Because of that, she said, only one B/C disposal site is probably needed in the country. In the meantime, she said, both onsite and offsite waste storage is increasing.

State regulatory concerns, she continued, include the security and safety of the stored B/C waste; state involvement in national policy and rulemaking changes, including any changes in waste classifications; unused and unwanted sources; financial assurance for decommissioning; and adverse impacts on research that generates B/C waste.

The NRC's Patrice Bubar discussed in greater detail the agency's current LLW initiative. Before 2007, she reminded the conference, only five federal employees were dedicated to the LLW program, so the agency did a strategic assessment to determine where it should concentrate those limited resources. However, Bubar continued, not everything identified in the assessment is being worked on at the level the assessment recommended, because of other demands. Those demands include DU, risk informing Part 61's waste classification framework, waste blending (also know as downblending, or concentration averaging), LAW disposal, the impact of the lack of LLW disposal on research, and financial assurance for sources. Today, she concluded, there are still only five full-time-equivalent employees devoted to this effort (plus additional bodies for decommissioning work), and she expects the staffing level to remain constant through fiscal 2011.

Life Without Barnwell

At meeting time, it had been just a little more than a year since the Barnwell LLW disposal site shut down to all but waste generators in the Atlantic Compact. A session on "Life Without Barnwell: Assessing the First Year" looked at what has happened since the June 30, 2008, shutdown.

Max Batavia, executive director of the Atlantic Compact, described a memorandum of understanding made between Chem-Nuclear Systems LLC (the Barnwell operator) and the South Carolina Budget and Control Board to guarantee that Chem-Nuclear will not lose money operating the site. In the first year of regional waste disposal, some 11 000 ft^3 of waste from 13 reactors was shipped to Barnwell, and 99 percent of the LLW being disposed of at Barnwell is coming from these reactors. For fiscal 2010, Batavia said he anticipates between 7000 and 9000 ft^3 of waste. Annual fees have been set to achieve break-even levels to ensure continuing operations, he stated.

Gary Butner, chief of the Radiological Health Branch of the California Department of Public Health, noted that California used to be on the forefront of research in the medical and biotech fields. Now, however, he said, those companies are leaving the state to relocate in states with access to disposal.

California used to be on the forefront of research in the medical and biotech fields. Now, however, those companies are leaving the state to relocate in states with access to disposal.

Dale Mack, director of radiation safety for the Morehouse School of Medicine, said he now encourages his researchers to minimize waste generation, use short-lived isotopes (that is, those with half-lives of less than 120 days; these are stored onsite for ten half-lives, Mack said, then released), use compaction for dry waste prior to its leaving the laboratory, ensure that activity actually exists in

waste products before disposal, and explore the use of nonradioactive protocols. Overall, he said, he has seen a decrease in radioisotope use in the university community.

In the meantime, Mack reported, the university is looking at long-term storage. The university doesn't necessarily embrace this, but they have no choice. Impacts of this decision include rising insurance rates and difficulty in finding suitable storage spaces.

Future challenges, Mack listed, include sealed sources, Class C waste requiring encapsulation, decommissioning of instruments with sealed sources (for example, he said, liquid scintillation counters), and orphaned sealed sources from legacy labs.

In the meantime, the university is looking at long-term storage. The university doesn't necessarily embrace this, but they have no choice. Impacts of this decision include rising insurance rates and the difficulty in finding suitable storage spaces.

The Stimulus "Spike"

Jonathan Kang, from EM's Office of Disposal Operations, said a rough estimate of the *additional* volume of waste needing disposal from stimulus projects comes in at around 400 000 cubic meters during the 2009–2011 time frame. The total volume for regular and stimulus waste estimates is about 1.83 million m^3, he said. Of course, he emphasized, these numbers are still "very soft."

Sharron DaCosta-Chisley, manager of National Programs for the U.S. Army Corps of Engineers, said that with the extra $100 million in stimulus money the Corps will get, they will be able to remediate 11 additional properties. On the national level, she continued, they originally projected that the entire FUSRAP project would be completed in 2012. Now, however, she said, they are looking at a 2020 completion, and that does not include Niagara Falls site work, as well as a few other sites.

What Utilities Are Doing

Mark Carver, manager of Fleet Radwaste for Entergy Services Inc., spoke on regulatory reform issues, notably the NRC's recent Branch Technical Position on concentration averaging. The objectives, he said, are to minimize the accumulation of B/C waste onsite and to identify alternative methodologies for determining accepted disposal options. International Commission on Radiation Protection dose conversion factors should be used to establish new concentration guidelines for key radionuclides, because some were found to be too restrictive. An ultimate goal, he said, is to eliminate all subcategories of LLW—no A/B/C waste classifications.

During the question period, an audience member asked, if a new site opens up, will the industry go back to business as usual? No, Carver said, because all the activities make sense, are useful, and mark the latest technology and thinking.

Miguel Azar, manager of radioactive waste for Exelon Nuclear, reported on EPRI's LLW research and development program on interim onsite storage. This was not something that "hit suddenly," Azar noted; EPRI has been working on the project for about 15 years. In 1992, he continued, EPRI developed guidelines for utilities on how to store. In the ensuing years, utilities have learned to do it safely, cost-effectively, and by working together. The NRC has reviewed the guidelines and approved of them. The scope of the guidelines includes startup evaluation, record keeping, containers, waste forms, monitoring and inspection, GTCC, end-of-storage issues, and transportation. In the future, work will concentrate on updating the guidance and capturing the lessons learned. New issues, Azar concluded, include outdoor storage.

In answer to a question from the audience on whether utilities would ever consider onsite *disposal,* the NEI's Andersen volunteered that soil and very low-level material have been disposed of on utility sites. However, he cautioned, the primary issue remains that while a community may have approved having an operating nuclear power plant site in their neighborhood, they may feel differently about having an LLW disposal facility.

Graham Johnson, supervising scientist with Duke Energy, discussed a few methods for B/C waste minimization, including media separation (utilities use a cation bed followed by an anion bed, rather than a mixed bed) and vessel shortloading (a configuration of mixed bed, then cation bed, a second mixed bed, and then the anion bed, where the first mixed bed is shortloaded).

Discussing methods listed in EPRI waste reduction guidelines published in 2007, Johnson specifically mentioned reuse of the online lithiated bed for the system cleanup bed, reduction of the radwaste cleanup system in-service run length, and greater in-service media management (e.g., don't run filters and ion beds all the time). These operational changes also bring additional benefits, Johnson continued, including reduced exposure and reduced accrual liability.

Speaking more generally, Johnson noted that both pressurized water reactors and boiling water reactors have shown a decreasing trend in B/C waste generation, but closer analysis indicates that there is a wide variance among plants on this metric. So, he said, there's still lots of scope for improvement.

Finally, Johnson explained that much of B/C waste is driven by strontium-90 and cesium-137. A nuclide-specific media program, he said, designed to reduce B/C generation in liquid radwaste systems and explore first-of-a-kind technologies, is focusing on developing resins to trap these radionuclides.—*Nancy J. Zacha, Editor*