

# D&D in the Next Generation

*A Report from the ANS 2001 Winter Meeting in Reno*

The commercial nuclear power industry is in an interesting state right now. A handful of plants are being decommissioned; the vast majority of the plants built are currently operating (and planning to do so for a considerable time); and, among a few long-range planners and optimists, new plant designs are appearing on drawing boards and, more importantly, boardroom tables.

So, what can those plants being decommissioned offer to the plants of the future? A great deal, as it turns out. This topic was the subject of a session at the 2001 American Nuclear Society Winter Meeting, held November 11–15 in Reno, Nev. The session, “Incorporation of

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and Reutilization Division, and organized by Sam Bhat-tacharyya of Argonne National Laboratory.

Lessons Learned for Decommissioning and Decontamination of Commercial Reactors to Next-Generation Nuclear Reactor Systems,” was sponsored by the Decommissioning, Decontamination,

## THE BIG PICTURE

Russ Mellor, president and CEO of Connecticut Yankee and Yankee Atomic (both single-asset utilities decommis-

sioning their plants), chose first to look at the big picture before moving on to more detailed advice for the next generation. The best thing we can do for plants of the future, he said, is solve the high-level waste/spent-fuel issue. And that does not mean merely building the repository at Yucca Mountain. "Yucca Mountain is already booked; there's no vacancy there," he said. So the industry and the politicians are going to have to look beyond Yucca Mountain to solve the HLW issue for the next generation. Among the solutions he tossed out—a new repository, spent-fuel reprocessing, transmutation, or an international repository (he mentioned Russia as one country possibly interested in siting such a facility).

Low-level and greater-than-Class-C (GTCC) waste issues must also be solved if a new generation of reactors is to be viable. The GTCC problem (that is, what to do with reactor internals) is especially nasty for plants, he said. With the exception of the Trojan reactor vessel, which was able to be disposed of with its internals intact at the Richland, Wash., LLW disposal facility, the internals must be removed from a reactor vessel before the vessel can be disposed of. Internals segmentation is a difficult job for utilities, with many radiation hazards. "Even when the projects go well,"

he noted, "it's not something you want to do." The entombment alternative, which would allow the radioactivity of the internals to decay before any attempt was made

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to remove them, is not a viable option for single-asset utilities (like Connecticut Yankee and Yankee Atomic).

Moving on to more detailed advice, Mellor urged the design of "decommissioning-friendly" plants, with modular designs and cleanable and irradiation-resistant materials. In addition, he said, we need to refine industry practices. For example, material storage practices need to be modified, he said—"We have to eliminate the boneyards." And contaminated surfaces should be cleaned—no "paintovers," he stated.

## DESIGN DETAILS

William Henries, director of engineering at Maine Yankee, another utility decommissioning its only plant, focused primarily on design issues but added a few more general suggestions at the end.

First, he said, plan and construct your independent spent-fuel storage installation (ISFSI) as you design the plant. Use multipurpose canisters, and ship your fuel to the repository as soon as you can. (This advice assumed that by the time new plants had been operating long

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enough to have shippable fuel, a repository, or repositories, would be available.) On the other hand, he said, utilities need to have more than one option for the fuel. Thus, he noted, reprocessing must come back in this country "if the next generation is to be viable."

Second, plan and design the spent-fuel pool to be "easily isolatable" from the remainder of the plant. Consider having a separate, self-contained cooling system and easy-to-transfer source of power, and plan for an adjacent control room/central alarm station. This could work more easily for pressurized water reactors than for boiling water reactors, he conceded.

Other design suggestions: The spent fuel pool crane should be a single-failure-proof crane and should be capable of handling dry-cask loading evolutions. Floor drains and buried piping should be eliminated; instead, use pipe tunnels and chases, trenches, and sumps. Improve the reactor pressure vessel internal material controls to reduce the GTCC volume. (Like Mellor, Henries noted what a "nasty" job cutting the internals turned out to be.) Vertical heat exchangers should have U-tubes at the top so they can be drained. Multiunit sites should avoid shared systems or else have upfront plans to safe-store until all units are decommissioned. Require that the weight of equipment be listed on the nameplate, and have lifting points attached to the equipment. Size the containment hatch for the largest equipment, or else reduce equipment size to fit through the hatch. Provide a spacious decontamination, waste storage, and processing facility, and ship waste as soon as possible to avoid buildup and legacy waste problems. Provide a large perimeter around the plant that is paved, lighted, and powered to be available for construction support activities.

Finally, he said, reduce the volume of concrete required, using steel structures where possible for ease of demoli-

tion. The sheer quantity of the concrete at Maine Yankee resulted in the state's classifying it as a "special waste," he noted, and the new regulations the plant was forced to comply with were a result of the magnitude of the concrete problem.

Among Henries's more basic, practical suggestions: Take pictures/videos of everything starting on Day 1; track waste spills and clean them as quickly as possible, and document cleanup closure; and, rather prosaic but valuable nonetheless, sign all documents in blue ink (with the new copiers, he said, it is difficult to tell the copies from the originals).

## OTHER SUGGESTIONS

Bill Trubilowicz, from Consumers Energy's Big Rock Point, also urged that new plant designs include the ISFSI right at the beginning. If you don't do that, either you have to reinstate fuel reprocessing, or, he suggested wryly, you will have to build all new plants at Yucca Mountain.

Other ideas (echoing those of other speakers but worth repeating): Use modular systems, eliminate embedded piping, isolate electrical systems, minimize concrete usage (find alternatives for shielding, he suggested), and use impervious coatings.

Above all, he said, keep your buildings clean. At Big Rock, he said, it takes them two weeks to do the building surveys but only two days to knock the building down.

And finally, he added, use hazard-free materials—specifically, don't use asbestos, mercury, PCBs, or lead. And design the systems to allow for chemical decontamination.

Jim Byrne, from FirstEnergy, which is decommissioning the old Saxon plant, urged designers to place groundwater monitoring systems under all structures. If you have buried waste tanks and piping, be assured that they will leak, he said. His other suggestions: Double-line concrete

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storage basins to prevent contamination; paint and seal all concrete surfaces; make embedded piping easy to remove. Remember, he cautioned, if it's hard to build something safely, imagine the difficulty in taking it down in a contaminated environment.

During the audience discussion after the presentations, Lynne Goodman, from Detroit Edison, made the pithy observation that at the early plants, the buildings were not designed to be *maintained*, let alone *taken down*. The next-generation plant designers have the opportunity to rectify all the early errors so that, 50 or 100 years from now, the industry won't need another session like this one.—Nancy J. Zacha, Editor ■