

Smarter on Low-Level Radioactive Waste

EPRI Informs Environmentally Sound Management and Disposal, Enables Millions in Savings

By Chris Warren

The bulk of the radioactive waste generated by nuclear power plants is classified as [low-level waste](#). In fact, the [World Nuclear Association](#) reports that just about 3% of power plant radioactive waste is considered [high-level waste](#) (primarily used nuclear fuel).

The U.S. Nuclear Regulatory Commission (NRC) divides low-level waste into three classes—A, B, and C—based on the concentration and nature of the radionuclides.

Class A, with the lowest concentration, comprises materials such as contaminated personal protective equipment, used ion exchange resins from non-reactor coolant systems, and contaminated soil. Given the low radioactivity, relatively low-cost disposal options are available.

Class B and C wastes typically comprise filters and ion exchange resins used to capture and remove radionuclides from the reactor coolant system. With disposal requirements more stringent than those of Class A, disposal costs are higher. EPRI estimates that it can be up to 10 times more expensive to dispose of Class B or C waste than Class A waste. It is important to classify waste properly and minimize waste generation, particularly Class B and C waste.

Since 2005, EPRI's [Radiation Safety Program](#) has developed guidance and technical solutions to assist utilities with environmentally sound, cost-effective approaches for low-level waste management and disposal. EPRI research has focused on techniques to minimize generation of Class B and C waste and to process wastes to maximize Class A waste volume.

LESS WASTE PRODUCED, LESS TO DISPOSE OF

As low-level waste disposal facilities faced closures in the mid-2000s, EPRI began investigating ways to

help plants produce less Class B and C waste. “Most U.S. plant operators were losing access to disposal facilities that accept Class B and C waste,” said EPRI Radiation Safety Program Manager Phung Tran. “Our research helped them implement practices to minimize generation of this waste, reducing waste storage and disposal costs.”

One strategy involved filter replacement. Traditionally, filters have been replaced on a prescribed schedule, serving for 18 to 24 months and often accumulating enough radionuclides for classification as Class B or C waste.

EPRI documented approaches for monitoring filters to determine when radionuclides approach levels requiring Class B or C disposal—then replacing the filters before radionuclides reach that level.

RESEARCH-DRIVEN CHANGES TO WASTE CLASSIFICATION

Since the 1980s, the methodology for classifying low-level nuclear waste has been dictated by the [NRC's Branch Technical Position on Concentrating Averaging and Encapsulation](#), or BTP.

The BTP's most recent revision in 2015 was informed by EPRI research. “We took into account the latest information on health effects, waste volumes, and disposal site designs to better understand how waste may impact the public many years from now,” said Tran. “This informed a new approach to the concentration averaging methods used to classify waste.”

As in previous versions, the revised BTP does not permit plant operators to mix non-radioactive materials with radioactive waste for the purpose of changing the waste classification. However, operators have more latitude to mix similar

radioactive materials containing different levels of activity. The resulting mixture is classified by its concentration of activity.

“The updated rules provide more flexibility in how plant operators average the radionuclide concentrations in their waste,” said Tran. “If plants can produce a certain amount of higher activity resin waste and have enough lower activity resin waste, they may be able to blend them to yield Class A waste for the entire volume. The final waste volume is less hazardous to workers and the public and less costly to dispose of.”

Following the BTP revision, EPRI organized a group of nuclear power plant operators, industry experts, disposal site operators, and state and federal regulators to develop guidance for its implementation.

As a result of the regulatory changes and EPRI’s guidance on waste reduction and concentration averaging, utilities have made changes leading to large savings. By applying EPRI’s guidance, Pacific Gas and Electric’s Diablo Canyon Power plant reduced Class B and C waste generation by more than 50%, with annual savings of \$400,000–\$500,000. Exelon expects to save about \$5 million in its 23-reactor fleet in five states. For plants implementing these techniques to reduce Class B and C waste, annual savings can reach about \$300,000.

KEY EPRI TECHNICAL EXPERTS

Phung Tran, Lisa Edwards

A New Waste Category?

Most waste produced during nuclear plant decommissioning and site remediation is lightly contaminated soil and building rubble. Given the very low concentration of radionuclides and similarly low risk to the public, the International Atomic Energy Agency established a separate waste category: very low-level waste.

Because of the lower risk, disposal facility requirements for this waste are less stringent and less costly than requirements for facilities managing higher activity waste. Engineering measures in place at hazardous, non-radioactive waste disposal facilities are considered sufficiently robust for the safe disposal of very low-level waste. While the United States does not have a very low-level waste classification, some states have processes that enable disposal of this kind of waste in hazardous, non-radioactive waste facilities.

EPRI research has shown that nuclear power plants and the public could benefit from reduced disposal costs if a new very low-level waste category allowed disposal of these materials at a non-radioactive waste disposal facility (such as an industrial or hazardous waste facility).

“The NRC is evaluating whether to begin a rulemaking process to develop a category for waste with extremely low levels of radioactivity,” said EPRI Senior Project Manager Lisa Edwards.

EPRI has evaluated how other countries approach this category, providing potential options for how it might be defined in the United States, should the NRC decide to move forward with rulemaking.

“Our research does not suggest that the U.S. should or should not do this,” said Edwards. “Rather, it provides technical information about the concept, shows how other countries approach it, and presents options for creating a category.”