

Articles and Commentaries Submitted to the LLW Forum

Submitted By:

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1. The Restart of Three Mile Island Unit 1 (now the Crane Clean Energy Center)

The announcement that Unit 1 of the former Three Mile Island nuclear power plant, now renamed the Crane Clean Energy Center (CCEC), will restart in a few years marks a major turning point for the nuclear energy industry.

The restart of CCEC reflect growing national support for low-carbon energy and the recognition that nuclear energy must be part of the solution to meet increasing electricity demand and climate goals.

Constellation Energy, the operator of CCEC, has entered into a long-term agreement to supply electricity to Microsoft. This partnership highlights the private sector's increasing commitment to nuclear energy as a reliable power source for data intensive operations such as data centers.

The restart of CCEC will generate significant economic benefits. It is expected to create substantial employment opportunities, both directly and indirectly. The plant is also projected to contribute billions of dollars in economic growth and tax revenue over the coming decades. This is critical for communities around CCEC that have long supported the site and the skilled workforce it has developed. I conducted oversight of operations at this facility, and I know firsthand the dedication and pride that characterize both the plant and its workforce.

The CCEC restart shows that, with the right policies and market conditions, existing nuclear plants can be successfully returned to service to help meet future energy needs. In parallel, renewing operating licenses for these facilities ensures their long-term viability and reinforces their role in providing reliable electricity well into the future.

As part of this effort, it will be essential to continue safe management of radioactive materials, including low-level radioactive waste (LLRW), to maintain the public's trust and protect the environment. The LLRW community must be prepared to support this effort by continuing to innovate and applying best practices across all aspects of waste management. Regulatory agencies need to provide clear guidance and flexible rules to ensure waste management remains safe, effective, and efficient as technologies and processes evolve.

2. Balancing Guidance and Regulation

In the regulatory world, rulemaking is often the primary approach for addressing technical or policy challenges. While it plays a critical role in establishing enforceable requirements, it is not always the most practical or efficient solution. In some cases, guidance can provide an effective

alternative, enabling regulatory agencies to respond to emerging issues without the delays of formal rulemaking.

A clear example is the Nuclear Regulatory Commission's (NRC) development of the *Reactor Oversight Process (ROP)*. The ROP replaced the older performance assessment framework for the nuclear power plants. It consolidated inspection, assessment, and enforcement policies into a risk-informed, performance-based system, all achieved through regulatory guidance and programmatic updates, without amending regulations in 10 CFR Part 50.

Similarly, in the low-level radioactive waste (LLRW) area, the NRC's *Branch Technical Position on Concentration Averaging and Encapsulation* demonstrates the agency's ability to address complex technical and policy issues outside of formal rulemaking, despite the impact this guidance has on states, compacts, waste generators, and disposal facility operators.

These cases highlight how the NRC has effectively used guidance to improve regulatory oversight and address complex challenges. In contrast, the *10 CFR Part 61 rulemaking* illustrates how regulatory process can sometimes take longer than initially anticipated. While comprehensive analysis and stakeholder engagement are essential, prolonged timelines may delay implementation of regulations.

Although rulemaking is crucial for establishing clear and enforceable requirements, standalone guidance could offer a more flexible and adaptive approach for addressing emerging issues, especially given the inherent rigidity of formal regulations. Regulatory agencies should carefully consider whether guidance can achieve the desired outcome before committing to the rulemaking process.

3. The Need for a Package Performance Demonstration Program at DOE

I have compiled the following key points to inform LLW Forum members about the importance of a Package Performance Demonstration (PPD) Program and the critical elements it should include. This overview draws on my direct experience with DOE's National Nuclear Security Administration. I was involved in the planning and oversight of shipments of radioactive materials, both solid and liquid, as well as spent nuclear fuel from Chalk River, Canada, through Pennsylvania to the Savannah River Site. It also reflects feedback I provided in response to DOE's request for input on the PPD program. While DOE's PPD program targets high-level radioactive waste and spent nuclear fuel, a successful demonstration could also enhance public confidence in shipments of all radioactive materials, including low-level radioactive waste.

Safety Assurance and Environmental Protection - PPD helps ensure that the packaging systems used for transportation can withstand severe accident scenarios without releasing dangerous levels of radiation or radioactive materials. This is critical for protecting public health, the environment, and transportation workers.

Compliance with Regulatory Requirements - Various domestic and international agencies have stringent packaging design standards that must be met. PPD provides a real-world validation that packaging systems comply with these requirements.

Public and Stakeholder Confidence – Showing that packaging is safe through a PPD helps build public trust, especially in communities along transport routes that are concerned about the risks of radioactive material shipments. DOE builds trust by providing clear reporting, allowing independent reviews, and offering real-time access to the public and media. As part of broader outreach, NNSA benefited greatly from publicly displaying the transport containers used for the Canadian shipments, as the displays increased understanding and helped gain support from local governments and emergency responders along the routes.

Continuous Improvement and Risk Management - PPD provides critical data on packaging performance under various conditions, allowing DOE to identify and address vulnerabilities early and improve designs before any incident occurs.

Economic Justification - While conducting a PPD may require upfront investment, it is far more cost-effective than facing the greater financial consequences and public backlash from a serious accident including cleanup, legal liabilities, and loss of trust.

Support for Long-Term Management of Radioactive Waste - Reliable transportation is key to the safe handling and disposal of radioactive waste. Conducting a PPD ensures DOE can safely move radioactive waste to interim storage facilities or long-term disposal sites.

In summary, the successful implementation of the PPD program can enhance stakeholder confidence and ensure the long-term credibility of the safe transport of radioactive materials. The waste management community can support DOE's PPD program by sharing real-world experience, providing constructive feedback, and building trust with stakeholders.

4. Promoting Waste Minimization Practices

Waste minimization (WM) often takes a back seat in conversations about low-level radioactive waste (LLRW), but it's an important part of managing waste responsibly. In addition to environmental benefits, effective WM programs can result in substantial cost savings by reducing storage, handling, and disposal costs. Many large generators have WM plans, but not all of them are equally effective. Smaller generators, in particular, often lack comprehensive waste management plans due to limited in-house expertise. Many licensed radioactive material facilities rely on Radiation Safety Officers whose training may focus on compliance and radiation protection, rather than on proactive WM strategies.

The absence of an effective WM plan can lead to the unintended accumulation of radioactive materials or radioactive waste on-site. This can occur in various ways, such as the failure to

consider manufacturer take-back programs or reuse options for radioactive sealed sources. Similarly, missing opportunities to apply WM techniques during cleanup and decontamination processes or inefficient segregation of materials can generate excessive secondary waste.

Creating an effective WM plan starts with leadership. Management should assign responsibility for WM initiatives, provide adequate resources, and ensure accountability for achieving WM goals. Facilities must then identify their waste generating activities and determine methods to reduce waste through process changes, material substitution, improved segregation, or improved inventory control.

The WM plan should include clear goals and measurable targets, such as reducing waste volume by a defined percentage or implementing procedures to limit unnecessary waste generation. The plan must also include a process to assess effectiveness of a WM plan, such as routine tracking of waste volumes, internal reviews, and continuous improvement initiatives.

Training programs should be implemented to build awareness of WM strategies throughout the organization. Many large generators of LLRW, such as nuclear power plants, incorporate WM practices into their training programs to promote a culture of WM across all levels of the organization. General employee training, whether for new hires or refresher courses for existing staff, is a key component of these programs and should likewise be adopted at other facilities.

All WM plans should follow the Waste Management Hierarchy, which prioritizes: (1) source reduction and waste avoidance-eliminating waste before it's created; (2) recycling and reuse-recovering value from materials; (3) treatment-reducing toxicity or volume; and (4) disposal-as a last resort when other options are not feasible. This hierarchy is widely recognized across both the nuclear and broader waste management sectors. Disposal is preferable to long-term on-site storage because it lowers future risks and reduces regulatory challenges.

The LLRW community has a responsibility to strengthen and promote WM. Collaboration through knowledge sharing, participation in industry forums, and engagement with regional compacts can help generators benefit from lessons learned and best practices across the LLRW community. Regulators and industry groups can also play a role in fostering this collaboration and encouraging adoption of WM best practices.