

**Testimony for the Record**  
**Marvin S. Fertel**  
**President and Chief Executive Officer**  
**Nuclear Energy Institute**  
**Committee on Environment & Public Works**  
**U.S. Senate**  
**May 14, 2014**

Chairman Boxer and Ranking Member Vitter, thank you for the opportunity to testify today on the decommissioning process for nuclear energy facilities. I am Marvin Fertel, president and chief executive officer at the Nuclear Energy Institute (NEI).<sup>1</sup> NEI is responsible for establishing unified nuclear industry policy on regulatory, financial, technical and legislative issues affecting the industry. NEI's 370 members include all U.S. companies licensed to operate commercial nuclear power plants, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, materials licensees, labor organizations, universities and other organizations and individuals involved in the commercial nuclear technology industry.

**NRC Decommissioning Process Is Sound, Promotes State Involvement**

Decommissioning is the process by which nuclear power plants are retired from service. It primarily involves decontaminating the facility to reduce residual radioactivity, dismantling the structures, removing contaminated materials and components to appropriate disposal facilities, and releasing the property for other uses. Decommissioning begins after the power plant licensee permanently ceases operation of the facility.

Nuclear Regulatory Commission regulations and associated guidance detail the requirements and process for decommissioning to ensure the process is safe and secure and meets applicable requirements.

The closure of more than 70 test and power reactors since 1960—including 17 power reactors sites that are undergoing decommissioning—shows the strength and flexibility of the NRC's approach to the process. In addition to federal oversight, the NRC's decommissioning process facilitates participation by state and local authorities at several points along the way.

---

<sup>1</sup> The Nuclear Energy Institute is responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including regulatory, financial, technical and legislative issues. NEI members include all companies licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

The decommissioning process as regulated and overseen today by the NRC is a safe and environmentally sound method for remediating nuclear power plant sites for other uses.

### **Overview of the Decommissioning Process**

Decommissioning a nuclear plant involves removing the used nuclear fuel rods from the reactor, dismantling systems or components containing radioactive products (such as the reactor vessel) and dismantling contaminated materials from the facility. All radioactive materials generally have to be removed from the site and shipped to a waste-processing, storage or disposal facility.

Contaminated materials may be cleaned of contamination on site, cut off and removed (leaving most of the component intact in the facility) or removed and shipped to a waste-processing, storage or disposal facility. Each company decides how to decontaminate materials based on the amount of contamination, the ease with which it can be removed and the cost to remove the contamination.

It also includes removing used fuel from the reactor and, ultimately, placing the fuel into robust and shielded dry storage containers for storage at the site. The company that produced electricity at the facility remains accountable to the NRC until decommissioning has been completed and its federal license is terminated. However, without the demands of running a power plant and with the greatly decreased risk of a significant accident after fuel is removed from the reactor, staffing in areas such as operations, maintenance, engineering, emergency preparedness and security and other onsite resources can be substantially reduced at this time.

Ten reactors have completed decommissioning and 17 commercial reactor sites are in the decommissioning process, including the recently closed Kewaunee, Crystal River 3 and San Onofre 2 and 3 power stations. Of these 17, 10 are using or transitioning to the SAFSTOR option, four are using the DECON option, and two have not yet chosen a decommissioning option. Three Mile Island 2—site of the 1979 accident—is in post-defueling monitored storage.<sup>2</sup>

### **Decommissioning Planning Occurs over Life of the Facility**

Although the decommissioning process begins when the facility operator ceases electricity production, planning for decommissioning takes place over the life of the facility. For example, throughout the operation of a nuclear power plant, from licensing through decommissioning, the licensee must provide the NRC with the assurance that sufficient funding will be available for the decommissioning process. Further, five years before expiration of an operating license, the licensee must provide the NRC with both a preliminary decommissioning cost estimate and a program description for managing used reactor fuel at the site after electricity production is stopped.

Once the licensee permanently ceases operation, it must submit a certification of permanent cessation to the NRC within 30 days. At this point, the reactor can be defueled. In that process,

---

<sup>2</sup> <http://www.nrc.gov/info-finder/decommissioning/power-reactor/>

trained reactor technicians remove nuclear fuel from the reactor vessel so that the facility is no longer able to produce electricity. Generally, this fuel is first placed in the used fuel storage pools on site to reduce its heat and radioactivity. After several years, this used fuel will be moved to container storage on site. After the reactor is defueled, the licensee must submit a certification of permanent fuel removal to the NRC. Once the NRC has docketed both certifications, the license no longer authorizes placement of fuel into the reactor.

### **Choosing a Decommissioning Option**

Within two years of shutting down the facility, the company must submit a post-shutdown decommissioning activities report (PSDAR) to the NRC and the affected states. Licensees have three options for decommissioning the site: decontamination (DECON), safe storage (SAFSTOR) or entombment (ENTOMB). The report must include a description of the planned decommissioning option:

- ***SAFSTOR (Safe Storage)***. In the SAFSTOR process, a nuclear plant is kept intact and placed in protective storage for up to 60 years. During this time, the main components including the reactor vessel, fuel pools, turbine and other elements remain in place. All fuel is removed from the reactor vessel and placed in fuel pools on site. Maintenance and security operations continue and the operator maintains an NRC license. The NRC continues to inspect the site and maintains regulatory oversight of maintenance and security. This method of decommissioning uses time as a decontaminating agent by allowing the radioactive elements in components to decay to stable elements. For example, if a plant is allowed to sit idle for 30 years, the radioactivity from cobalt 60 will be reduced to 1/50th of its original level; after 50 years, the radioactivity will be about 1/1,000th of its original level. After radioactivity has decayed to lower levels, the plant is dismantled in a process similar to the DECON option. Facilities using SAFSTOR include Dresden 1, Indian Point 1, LaCrosse and Peach Bottom 1.
- ***DECON (Decontamination)***. In DECON, all components and structures that have been exposed to radiation are cleaned or dismantled, packaged, and shipped to a low-level radioactive waste disposal site or stored temporarily on site. This work can take five years or more. Generally, used nuclear fuel rods in the fuel storage pool are placed in container storage at the site. When decontamination is completed, the used fuel will continue to be managed at that site under the NRC license and subject to agency oversight until it is shipped offsite for consolidated storage or permanent disposal.
- ***ENTOMB***. This option involves encasing radioactive structures, systems and components in a long-lived substance, such as concrete. The encased plant would be appropriately

maintained, and surveillance would continue until the radioactivity decays to a level that permits termination of the plant's license and unrestricted release of the property. To date, no company has requested this option.

The PSDAR report to the NRC also must include a schedule to complete decommissioning, a discussion of how site-specific decommissioning activities will adhere to previously issued environmental impact statements, and an estimate of expected costs. The NRC reviews the report and holds public meetings to discuss the company's decommissioning plans and the regulatory oversight process.

While this process is under way, the licensee may perform routine activities, such as maintenance and controlled disposal of small radioactive components. The licensee does not have access to the full amount of funds it has put aside for decommissioning until the site-specific cost estimate has been accepted by the NRC.

Ninety days after submittal of the PSDAR, the operator may begin major decommissioning activities. These include the permanent removal of large components—such as the reactor vessel, steam generators and other components that are comparably radioactive—as well as permanent changes to the containment structure. NRC's regulations dictate when and for what purposes decommissioning funds can be used.

The site must be decommissioned within 60 years of the plant ceasing operations. Licensees can choose to end SAFSTOR at any point during the 60-year period and transition to DECON. Alternatively, licensees can choose to begin DECON at the beginning of the 60-year period. All sites must transition to DECON at some point so that decontamination can begin. Generally, sites must spend no longer than 50 years in SAFSTOR to allow 10 years for the DECON stage of decommissioning.

The SAFSTOR and DECON options allow licensees to choose the optimal time and method for decommissioning their particular site. The NRC maintains continual oversight of a nuclear energy facility until it is fully decommissioned.

### **What Happens During the DECON Phase?**

In the DECON phase, the operator first decontaminates or removes contaminated equipment and materials. Used nuclear fuel rods and equipment account for more than 99 percent of the plant's radioactivity. Their removal lowers the level of radiation and thus reduces the potential exposure of workers during subsequent decommissioning operations.

Next, the plant operator addresses the small amount of radioactivity remaining in the facility, which must be reduced to harmless levels through a cleanup phase called decontamination.

Workers remove surface radioactive material that has accumulated inside pipes and heat exchangers or on floors and walls that were not decontaminated during normal plant operations because of inaccessibility or operational considerations. Workers are aided in decontamination activities by the records that plants are required to keep during operation. Chemical, physical, electrical and ultrasonic processes are used to decontaminate equipment and surfaces. The removed radioactive material is packaged and transported or stored for disposal at a designated low-level radioactive waste management site.

Throughout the decommissioning process, regulatory oversight is provided by the NRC, Occupational Safety and Health Administration, Department of Transportation and U.S. Environmental Protection Agency. State agencies also have played a significant role in the decommissioning of certain sites.

### **Terminating the NRC License, Releasing the Site**

As DECON nears completion, the licensee must submit a license termination plan to the NRC at least two years before the proposed license termination date. The NRC will make the plan available for public comment and schedule a public meeting near the facility to discuss its contents. Most plans envision releasing the site to the public for unrestricted use, meaning any residual radiation would be below NRC's limits of 25 millirem annual exposure.

The licensee's license termination plan must include:

- Site characterization.
- Identification of remaining site dismantlement activities.
- Plans for site remediation.
- Detailed plans for final radiation surveys for release of the site.
- A method for demonstrating compliance with the radiological criteria for license termination
- Updated site-specific estimates of remaining decommissioning costs.
- A supplement to the environmental report that describes any new information or significant environmental changes associated with the owner's proposed termination activities.

The NRC uses its "Standard Review Plan for Evaluating Nuclear Power Reactor License Termination Plans" (NUREG-1700) to ensure the quality and uniformity of license termination plan reviews. The NRC also will notify and solicit comment from state and local governments in the vicinity of the site.

NRC approval of the license termination plan would be issued in the form of a license amendment, which triggers an opportunity to request an adjudicatory hearing. Once any concerns with the plan are addressed, the NRC will approve the plan.

Finally, if the NRC determines that all work has followed the approved license termination

plan—and if the final radiation survey demonstrates that the facility and site are suitable for release—the agency will terminate the license.

### **Opportunities for State and Local Engagement**

There are multiple opportunities for public involvement and state participation in the decommissioning process, including:

- The licensee’s PSDAR report to the NRC is shared with affected states.
- After submittal of the PSDAR report, the NRC holds a public meeting in the vicinity of the facility. Affected states may also submit comments on the PSDAR.
- Licensees must notify the NRC in writing before performing any decommissioning activity inconsistent with PSDAR and copy any affected states.
- Another public meeting is scheduled when the NRC receives the license termination plan. At this time, affected states, local communities and tribes may submit comments on the plan.

In addition, when the NRC holds a meeting with the licensee, members of the public may observe the meeting (except when the discussion involves proprietary, sensitive, safeguards or classified information).

### **Funding Requirements for Decommissioning**

The NRC’s decommissioning funding regulations are the product of a decade-long deliberative rulemaking that resulted in a 1988 rule.<sup>3</sup> Since then, the NRC has continued to develop its regulatory framework for decommissioning funding through subsequent rulemakings and the issuance and updating of guidance. As a result, reactor licensees must comply with the robust decommissioning funding framework to assure that adequate funds will be available when needed. Every company that operates a U.S. nuclear energy facility is required to accumulate the funds needed to decommission all portions of its facility that have been contaminated by radioactive material. Specifically, the NRC’s regulatory structure provides decommissioning funding assurance through multiple layers of requirements and limitations, including:

- Establishing a minimum certification amount for decommissioning, which is based on technical studies and serves as a standard representing the minimum amount of decommissioning financial assurance that licensees must provide during plant life.
- Requiring adjustment of the minimum certification amount annually to account for inflation over time.
- Limiting funding assurance mechanisms to those considered appropriate by the NRC for assuring that decommissioning funding will be available when needed.

---

<sup>3</sup> 53 Fed. Reg. 24,018, 24,019-20 (June 27, 1988).

- Limiting the estimated future growth of decommissioning funds over time to a conservative rate of return over inflation, absent allowance of a different rate of return by a rate-setting authority.
- Requiring submittal of a report on the status of decommissioning funds compared to the minimum certification amount on a biennial basis.
- Providing for updating of funding levels, if necessary.
- Requiring a more precise preliminary decommissioning cost estimate at or about five years prior to plant shutdown.
- Requiring a site-specific cost estimate within two years of plant shutdown.
- Requiring an updated site-specific estimate of remaining decommissioning costs at least two years prior to license termination.
- Prohibiting use of decommissioning funds for any purpose other than decommissioning, both during and after plant shutdown.

The NRC's regulatory framework has been proven effective by the fact that every power reactor that has shut down, and has been or is currently being decommissioned, has been able to fund and safely perform required decommissioning activities. This has been the case even in situations in which the licensee did not operate the facility to the end of its license term.

Further, in 2013, the NRC found that commercial reactor operators have adequate funds for decommissioning their facilities and that the agency's formula for determining the minimum amount of required funding assurance yields sound results. NRC staff noted in a report, SECY-13-0105, that as of Dec. 31, 2012, licensees for 100 of the then-104 reactors provided the full amount of decommissioning funding assurance. The remaining four had "provided information to resolve their [decommissioning funding] shortfalls." Another agency paper, SECY-13-0066, said the NRC staff is satisfied with the adequacy of the funding formula used to determine the required level of decommissioning funding.

## **Conclusion**

The nuclear energy industry has proven that it has the technology, resources and expertise to successfully decommission commercial nuclear reactors. The decommissioning process, as overseen by the NRC with input from state and local government, is a proven and appropriate method for ensuring that the decommissioning of nuclear energy facilities is accomplished in a safe, secure and environmentally friendly manner. The process also is flexible, allowing licensees to choose one of three decommissioning options—overseen by the regulator—over a 60-year period. The decommissioning process provides ample opportunities for interaction from states, local communities and tribes—allowing the public to attend meetings, provide comments and have access to plant-specific decommissioning information. Finally, the NRC ensures that adequate funds for decommissioning will be available when needed through a system that requires licensees to amass funds needed to decommission their facilities.

Decommissioning nuclear energy facilities—with independent oversight by the NRC and timely interaction with state and local authorities—has been effectively managed and funded in a safe and environmentally sound manner under existing regulations.