Journal of the National Association of Administrative Law Judiciary

Volume 36 | Issue 2 Article 5

12-15-2016

Lights Out: Decommissioning the American Nuclear Plant

Joseph D. McManus

Lights Out: Decommissioning the American Nuclear Plant

By Joseph D. McManus*

I. INTRODUCTION

A thousand people—a mix of former and current employees, and their families—gather at the nuclear power plant site. Security personnel are showing people where to park, leading vans, station wagons, and pickup trucks to the makeshift overflow parking in a nearby field. The security officer is helpful and pleasant but has a look of uncertainty and worry about her. Prominent businesspeople, higher ups of the company who own the plant, and the local politicians are there too. There is a bittersweet sadness among the people; they are sad about what is about to take place—permanent shutdown is imminent. However, today is about celebrating the years of the life of the power plant. There can be no doubt that this plant has benefitted the local town's economy and offered high-paying jobs to its employees. Going forward, the town and the state's tax base will be negatively impacted. Many at the plant may lose their jobs or transfer to another location within the company; some people will stay and take on new roles. Those employees that are leaving have likely spent their whole adult lives at the plant, and for the first time that following Monday morning, they will not know what to do with themselves.[1]

This article seeks to examine the United States commercial nuclear power plant decommissioning process, a look into a subject that begins at the end of a nuclear plant's life. The subject is often overlooked in favor of the more dominant and controversial issue of when and where a federal spent nuclear fuel repository will be established. But to overlook the American nuclear plant decommissioning process would be a missed opportunity to

---

* Pepperdine School of Law, J.D. 2016, Humboldt State University, B.S. 2014. The author worked for Pacific Gas & Electric Company from 2006–2014 at the decommissioning of Humboldt Bay Power Plant and the construction and operation of Humboldt Bay ISFSI in Eureka, California. Any opinions, recommendations, and conclusions in this article reflect those experiences and are solely the opinions and observations of the author.

[1] When Big Rock Nuclear Plant permanently ceased power operations, a crowd, much like this described scene, took place. "A sad sweet moment," an operator said, and at 10:33 a.m., the plant was permanently shut down with a final tribute: "Good-bye, Big Rock. Sorry to see you go." *See* Betsy Tomkins, *Big Rock Point: From groundbreaking to greenfield*, NUCLEAR NEWS, November 2006, at 36, http://www2.ans.org/pubs/magazines/nn/docs/2006-11-3.pdf.

understand what happens after a nuclear plant permanently ceases power operations—a process that has the potential to last decades and affect the plant's local community through economic and environmental impacts.

The decommissioning process for a commercial nuclear power plant is inevitable for each of the 100 operational licensed nuclear reactors currently providing electricity in the United States.[2] The licensees that own the reactors have sixty years to complete the process,[3] and not all plants are built alike. Some have unique challenges in decommissioning due to their geographic location,[4] when they were built, and their adjacency to a non-nuclear power-generating unit, like a coal or natural gas plant, for instance.[5]

There are currently nineteen power reactors, at fourteen sites, and spanning across ten different states that are in some phase of decommissioning.[6] Decommissioning "involves safely removing a facility or site from service and reducing residual radioactivity to a level that permits the license to be terminated, with the property

---

[2] *Operating Nuclear Power Reactors (by Location or Name)*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/info-finder/reactors/ (last visited Dec. 21, 2016). A nuclear power plant may have more than one power reactor. *Id.* For example, Diablo Canyon Power Plant operates two reactors at its site in Avila Beach, California. *Id.*

[3] 10 C.F.R. § 50.82(a)(3) (2014).

[4] Geographical considerations include the natural environment and the potential impact of decommissioning upon it. Plants that are adjacent to wetlands, rivers, woodlands, and coastline that can further complicate decommissioning due to environmental concerns.

[5] For example, Humboldt Bay Power Plant 3 in Eureka, California had an operating a natural gas plant adjacent to it during decommissioning. *See Read about the nuclear plant decommissioning project*, PG&E, https://www.pge.com/en_US/about-pge/environment/what-we-are-doing/buildings-and-operations/humboldt-bay-power-plant.page (last visited Dec. 21, 2016). Additionally, Crystal River 3 in Crystal River, Florida has adjacent coal plants. *See Crystal River Nuclear Plant*, Duke Energy, https://www.duke-energy.com/our-company/about-us/power-plants (last visited Dec. 21, 2016) (follow: "Florida" hyperlink; then follow "Crystal River Nuclear Plant—Crystal River, Florida" hyperlink). Having an active electrical generating unit immediately adjacent to the decommissioning unit gives cause for careful planning and execution of the decommissioning while not to interrupt power operations.

[6] *Sites Undergoing Decommissioning (by Location or Name)*, U.S. NUCLEAR REG. COMM'N, www.nrc.gov/info-finder/decommissioning (last visited Dec. 22, 2016).

released either for unrestricted use or under specified restricted conditions."[7] Permanently removing a facility from power generating operations includes defueling the reactor and storing the spent fuel in the on-site Spent Fuel Pool (SFP),[8] and if the licensee so elects, later an on-site Independent Spent Fuel Storage Installation (ISFSI). As of August 2015, seventy-five sites in thirty-four states have an operational ISFSI, with five other sites actively pursuing an ISFSI license.[9]

II. THE COMMISSION IN THE DECOMMISSIONING PROCESS

The United States Nuclear Regulatory Commission (NRC) is the independent federal administrative agency that regulates commercial nuclear plants.[10] In addition to commercial nuclear plants, the NRC regulates university research reactors, nuclear materials such as radioactive hospital sources, and waste storage facilities such as low-level radioactive waste sites, to name a few.[11]

The NRC is made up of five Commissioners, one of them as Chairman, appointed by the President and confirmed by the Senate.[12] The Commissioners' terms are for five years, and the NRC reports to Congress annually.[13] The NRC is headquartered in Rockville, Maryland and is split into four regions of the country where it inspects reactor sites.[14] The NRC's budget for fiscal year 2015 is

---

[7] *Id.*

[8] *See Spent Fuel Pools*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/waste/spent-fuel-storage/pools.html (last visited Dec. 22, 2016). A SFP is a steel-lined pool of demineralized water for the storage of the spent nuclear fuel. *Id.* The water serves as natural coolant for the fuel as well as a radiation shield. *Id.*

[9] *U.S. Independent Spent Fuel Storage Installations (ISFSI)*, U.S. NUCLEAR REG. COMM'N, http://pbadupws.nrc.gov/docs/ML1524/ML15240A058.pdf (last visited Dec. 22, 2016).

[10] U.S.NUCLEAR REG. COMM'N, NRC INFORMATION DIGEST 2015–2016 xi (2015) [hereinafter NRC DIGEST].

[11] *See id.* at 59, 61, 76.

[12] *The Commission*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/about-nrc/organization/commfuncdesc.html (last visited Dec. 22, 2016).

[13] *Id.*

[14] NRC DIGEST, *supra* note 10, at 7. The regions are divided as follows: Region I is located King of Prussia, Pennsylvania and covers the northeastern

$1.153 billion; and by law, the NRC must collect 90% of its budget back from billing licensees for their inspections and activities.[15] For fiscal year 2015, the NRC projects to collect $895.5 million from licensees, and those fees would be transferred to the U.S. Treasury by the end of the fiscal year.[16] From a licensee's perspective, however, this financial scheme suggests that the NRC may have a conflict of interest in remaining neutral. For example, if a plant fails an inspection, the licensee must pay for another inspection within the timeframe set forth by the regulations.[17] Thus, it seems like there would be incentive for the NRC to fail licensees on inspections; however, there have been no reports of this nature to suggest this proposition. On the other hand, the NRC is financially supported by its regulated entities—thus, if the NRC permanently shuts down a plant for enforcement violations, its budget will naturally shrink.[18] Therefore, according to the doctrine of regulatory capture,[19] logic would suggest that the NRC would be extremely hesitant to shut down a nuclear power plant, no matter the degree of the licensee's violations. However, there has been no data or study supporting the proposition.

The NRC's inception was the result of the Energy Reorganization Act of 1974.[20] Before this Act, the Atomic Energy Act of 1954[21] gave the NRC's predecessor, the Atomic Energy Commission (AEC), the "responsibility for the development and production of nuclear weapons and for both the development and the safety regulation of

---

United States; Region II is located in Atlanta, Georgia and covers the mid-atlantic and southern regions of the United States; Region III is located in Lisle, Illinois and covers the midwestern region of United States; and Region IV is located in Arlington, TX and covers the southern and western states. *Id.* at 7, 10.

[15] *Id.* at 11.

[16] *Id.*

[17] *See* 10 C.F.R. § 170.20 (2015) for fees associated with NRC staff-hour labor rates.

[18] *See* 10 C.F.R. § 171.15 (2015) for annual fees for licensees.

[19] "[W]here an industry gains control of an agency meant to regulate it." *See* Frank N. Von Hippel, *It Could Happen Here*, NEW YORK TIMES (March 23, 2011), http://www.nytimes.com/2011/03/24/opinion/24Von-Hippel.html?_r=3&scp=1&sq=frank%20von%20hippel&st=cse (last visited Jan. 11, 2017).

[20] 48 U.S.C. § 5801 (2012).

[21] 48 U.S.C. § 2011 (2012).

the civilian uses of nuclear materials."[22] The Energy Reorganization Act of 1974 divvied up these two responsibilities between two agencies: the newly formed NRC, which would regulate civilian nuclear industry and materials, and the Department of Energy (DOE), which would develop and produce nuclear weapons and promote nuclear power.[23] This way, the NRC could regulate the industry without worrying about the promotion of nuclear power—leaving that to the Department of Energy—which could have been interpreted as a conflict of interest.

The NRC's most principle major activity is to regulate the civilian nuclear power industry.[24] It accomplishes its mission by establishing regulations and guidance for licensees and license applicants through formal and informal rulemaking; it issues licenses[25] and can terminate them if warranted.[26] The NRC also conducts inspections of licensees and enforces regulations upon the licensee if it has failed to comply by issuing sanctions upon the licensee.[27]

Perhaps the most important functions of the NRC are to protect the health and safety of the public. This is done, in part, through inspections and observations of the plant. In addition, the NRC reviews the plant's safety culture, also known as a Safety Conscious Work Environment (SCWE).[28] For example, a good SCWE at a

---

[22] *Governing Legislation*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/about-nrc/governing-laws.html (last visited Dec. 22, 2016).

[23] *Id*. Another good reason for splitting the AEC's duties between the NRC and the DOE is that there may be a conflict of interest when a regulator promotes the very industry it is regulating. Notwithstanding this responsibility split, the NRC is sometimes seen as an advocate for nuclear power, and the debate continues today. *E.g.* U.S. HOUSE OF REPRESENTATIVES, NRC'S COZINESS WITH INDUSTRY: NUCLEAR REGULATORY COMMISSION FAILS TO MAINTAIN ARMS LENGTH RELATIONSHIP WITH NUCLEAR INDUSTRY (1987).

[24] *See* NRC DIGEST, *supra* note 10, at 2.

[25] *Backgrounder on Reactor License Renewal*, U.S. NUCLEAR REG. COMM'N, https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-reactor-license-renewal.html (last visited Jan. 11, 2017). Nuclear operating licenses are usually issued for a period of 20 years, and can be renewed. *Id.*

[26] *How We Regulate*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/about-nrc/regulatory.html (last visited Dec. 22, 2016).

[27] *Id.*

[28] *Id.*

facility would include prompt reporting of problems at the site for repair, with the employee feeling free to raise and report issues and problems as they arise.[29]

Perhaps the most prominent issue of SCWE—that came to the nation's forefront in 1996 and caused the NRC to revise its own procedures—took place at Millstone, a decommissioning nuclear plant in Connecticut. In 1992, George Galatis, an engineer at Millstone, identified an issue with the process of "full core offloads"[30] that were not permitted by the plant's licensing basis.[31] The spent nuclear fuel was being moved to the Spent Fuel Pool (SFP) within sixty-five hours of the offload, not in accordance with the required 250 hours.[32] According to the plant's original licensing documents, the SFP[33] could only support the heat of 8 million British Thermal Units (BTUs). However, the offload of the spent fuel into the spent fuel pool at sixty-five hours was calculated to generate 23 million BTUs.[34] Worried about the possibility of radioactive steam caused by the intense heat of the spent fuel, Galatis reported this issue to Millstone management to no avail.[35] Two years later, Galatis reported the license violation to the NRC.[36] After months of hearings

---

[29] On the other hand, a "chilled" work environment

> refers to a perception that the raising of safety concerns is being suppressed or discouraged—either outright with discrimination—or by a slow or no response . . . if workers are subjected to harassment, intimidation, retaliation, discrimination, or other discouraging behaviors by management for reporting safety concerns, a "chilled" work environment may be created that could inhibit workers from reporting additional safety concerns.

Maria E. Schwartz, *The Importance of Paying Attention to "Chill"*, U.S. NUCLEAR REG. COMM'N (Dec. 26, 2012), http://public-blog.nrc-gateway.gov/2012/12/26/the-importance-of-paying-attention-to-chill/.

[30] *See* Eric Pooley, *Nuclear Warriors*, TIME MAGAZINE (March 4, 1996), http://content.time.com/time/magazine/article/0,9171,984206,00.html (last visited Jan. 11, 2017). A "full core offload" is when all of the irradiated fuel in the reactor is removed to the SFP. *Id.*

[31] *Id. See also* Licensing Professional Development Seminar, Scientech (2012) (unpublished manual) (on file with author) (hereinafter Scientech).

[32] *Id.*

[33] *See U.S. Independent Spent Fuel Storage Installations (ISFSI)*, *supra* note 8.

[34] Scientech, *supra* note 31, at 32.

[35] Pooley, *supra* note 30.

[36] *Id.*

and testimony, Galatis was not satisfied with the NRC's response.[37] Galatis then told his story to Time Magazine, who ran Galatis's tale as a front-page story.[38] After the story went public, there was "significant public and political backlash against the NRC and utility management."[39] Consequently, all three Millstone generating units were shut down by the NRC until the licensee could show it was in compliance with all of its licensing documents and regulations.[40] Millstone Units 2 and 3 were restarted in 1999 and 1998 respectively, but Unit 1 was never restarted.[41] Currently, Unit 1 is in a phase of decommissioning, and the licensee is storing its spent fuel in an SFP instead of an ISFSI.[42]

To enforce its regulations, the NRC has "checkbook authority," which means that it has the power in its enforcement proceedings to fine a licensee.[43] For example, under the Atomic Energy Act of 1954, as amended, section 234 authorizes the NRC to impose monetary fines of regulatory violations "not to exceed $100,000 per violation per day."[44] The maximum the NRC can fine a licensee is currently $140,000 per violation, per day.[45] At first glance, a licensee (usually a publicly traded utility company)[46] may think that it would be better off just paying the fine and work toward achieving compliance. However, the NRC also has the power to issue orders[47]

---

[37] *Id.*

[38] *Id.*

[39] Scientech, *supra* note 31, at 36.

[40] Scientech, *supra* note 31, at 38.

[41] *Id.*

[42] *Millstone – Unit 1*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/info-finder/decommissioning/power-reactor/millstone-unit-1.html (last visited Dec. 22, 2016).

[43] The NRC's checkbook authority and enforcement jurisdiction stems from its organic statutes, the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, as amended. *Enforcement Authority & Regulations*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-authnregs.html (last visited Dec. 22, 2016).

[44] *Id.*

[45] *Id.*

[46] For example, Exelon (EXC), Entergy, (ETR) Southern Co. (SO), and NextEra Energy (NEE), to name a few; however, there are licensees that are government affiliated, like Tennessee Valley Authority (TVA) for example.

[47] Atomic Energy Act of 1954, as amended, § 161.

and revoke licenses under certain circumstances.[48] A licensee with a revoked nuclear operating license cannot legally operate, and a non-operating plant means that the licensee is not earning any money. Therefore, a robust compliance and Corrective Action Program[49] is usually the cheapest and best way for the licensee to continue to be viable.

Although the threat of a forced shutdown by the NRC is nonexistent for a decommissioning nuclear plant (since the plant has already permanently ceased power operations), the NRC has the authority to halt the decommissioning project for however long it desires to have the licensee rectify whatever issue the NRC identified.[50] This can cause monetary problems for the licensee when trying to manage the Decommissioning Trust Fund (DTF).[51] This can also cause increased scrutiny by the NRC when the issue is rectified, which could be for the duration of the decommissioning project. Specifically, how the NRC regulates decommissioning plants includes

> (1) developing regulations and guidance to assist staff and the regulated community; (2) conducting research to develop data, techniques, and models used to assess public exposure from the release of radioactive material resulting from site decommissioning; (3) reviewing and approving decommissioning plans (DPs) and license termination plans (LTPs); (4) reviewing and approving license amendment requests

---

[48] *Id.* at § 186.

[49] Decommissioning plants and ISFSIs have Corrective Action Programs for their employees to input problems as they arise, whether they be physical problems (e.g. inoperable equipment in need of repair) or procedural problems, so that the problem be recognized and assigned to the appropriate department to resolve the identified issue. *See* 10 C.F.R. § 50, App. B (2007) (for decommissioning plants) and 10 C.F.R. § 72.172 (2007) (for ISFSIs).

[50] Derived from its power pursuant to the Atomic Energy Act of 1954, as amended. "The NRC has full authority to take whatever action is necessary to protect public health and safety and may demand immediate licensee actions, up to and including a plant shutdown." K. Jocelyn Lian, *Time to Hear from the Public about the NRC's Reactor Oversight Program*, U.S. NUCLEAR REG. COMM'N (Dec. 5, 2011), https://public-blog.nrc-gateway.gov/2011/12/05/time-to-hear-from-the-public-about-the-nrcs-reactor-oversight-program/.

[51] *See infra*, Part H.

> for decommissioning facilities; (5) inspecting licensed and non-licensed facilities undergoing decommissioning; (6) developing environmental assessments (EAs) and environmental impact statements (EISs) to support the NRC's reviews of decommissioning activities; (7) reviewing and approving final site status survey reports; and (8) conducting confirmatory surveys.[52]

As the NRC's mission is to "protect the public health and safety, the environment, and the common defense and security,"[53] the NRC regulates the decommissioning plant and process by "reviewing decommissioning or license termination plans, conducting inspections, and monitoring the status of activities to ensure that radioactive contamination is reduced or stabilized."[54]

III. DECOMMISSIONING THE AMERICAN NUCLEAR PLANT

A. Various Ways to Decommission

After the licensee decides to permanently cease power operations at its nuclear plant, usually for economic considerations,[55] the licensee has thirty days to notify the NRC.[56] The licensee shall,

---

[52] *Decommissioning of Nuclear Facilities*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/waste/decommissioning.html#how (last visited Dec. 22, 2016).

[53] *The Nuclear Regulatory Commission Fact Sheet*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/reading-rm/doc-collections/nuregs/brochures/br0099/r10/#mission (last visited Dec. 22, 2016).

[54] *Decommissioning of Nuclear Facilities*, *supra* note 52.

[55] *Compare* Vermont Yankee Nuclear Power Plant, Vernon, VT, where Entergy (the licensee) decided that it was not economically feasible to continue operating the aged plant due to low natural gas prices; *with* Southern California Edison's San Onofre Nuclear Generating Station (SONGS) Units 2 and 3, where a crack in steam generator tubing shut the plant down for two years and eventually ended its run in generating power for California (economic infeasibility was also a consideration). *See Closing Vermont Yankee*, NUCLEAR ENERGY INST., http://www.nei.org/Knowledge-Center/Closing-Vermont-Yankee (last visited Dec. 22, 2016). *See also* Jeff McDonald, *It's Not Just The Steam Generators That Failed*, SAN DIEGO UNION–TRIBUTE (Jan. 30 2016), http://www.sandiegouniontribune.com/news/2016/jan/30/san-onofre-anniversary/.

[56] 10 C.F.R. § 50.82(a)(1)(i) (2014).

"[p]rior to or within 2 years following permanent cessation of operations . . . submit a post-shutdown decommissioning activities report (PSDAR) to the NRC, and a copy to the affected State(s)."[57] The NRC does not approve the PSDAR.[58] The PSDAR shall include the licensee's plan for decommissioning, a timeline of how long the decommissioning will take, as well as any environmental impacts that decommissioning would have that would not already be covered by previously considered EISs.[59] The licensee shall also submit a Decommissioning Cost Estimate (DCE), including the cost of managing irradiated and spent fuel.[60] Licensees cannot undertake any major decommissioning activities until the NRC has received the PSDAR and all submittals from the licensee certifying that the licensee has permanently ceased power operations as well as certifying that the reactor has permanently been defueled.[61]

Licensees have three approved methods of decommissioning its plant: DECON, SAFSTOR, and ENTOMB.[62] DECON involves immediate dismantlement and decontamination of the plant soon after the licensee permanently ceases power operations.[63] The decontaminated structures and equipment from the newly shutdown plant must meet NRC requirements for the licensee to use the site freely and terminate its NRC-issued license.[64] One issue with the immediate DECON strategy is that after the permanent cessation of power operations, plant structures and equipment will likely be

---

[57] *Id.* § 50.82(4)(i).

[58] *See Decommissioning Process*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/waste/decommissioning/process.html (last visited Dec. 22, 2016).

[59] *Id;* per the National Environmental Policy Act (NEPA), EISs are assessments of qualifying federal actions that have the potential to affect the environment. *See* 42 U.S.C. § 4332 (2)(C) (2006).

[60] *Id. See infra*, Part D (illustrating where the Dep't of Energy failed to take the spent fuel from commercial licensees in 1998).

[61] 10 C.F.R. § 50.82(5) (2014).

[62] *Backgrounder on Decommissioning Nuclear Plants*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/decommissioning.html (last visited Dec. 22, 2016).

[63] *Id.*

[64] *Id.*

highly radioactive.[65] Therefore, components with higher radioactivity will cause increased safety issues for personnel dismantling the plant as well as the increased costs incurred by the licensee from the waste disposal facility's acceptance of the plant's most radioactive components.[66]

The most popular method of decommissioning in the nuclear industry is SAFSTOR.[67] SAFSTOR is where the "nuclear facility is maintained and monitored in a condition that allows the radioactivity to decay; afterwards, the plant is dismantled and the property decontaminated."[68] SAFSTOR puts the permanently defueled plant in essentially a routine of general maintenance and upkeep and the plant is "mothballed" for a certain timeframe. Depending on the licensee's strategy, it may be five, ten, or sometimes thirty years before the licensee decides that major decommissioning activities should commence.[69] SAFSTOR permits a much safer way of decommissioning for plant personnel as radioactive levels drop to much more manageable levels for Radiation Protection (RP) personnel to manage. The NRC permits the licensee to use a combination of DECON and SAFSTOR as well, where some portions of the plant would be immediately decommissioned after permanent cessation of power operations under DECON and the rest

---

[65] *Id.*; *see also* U.S. DEP'T OF ENERGY, DOE HDBK-1019/1-93, DOE FUNDAMENTALS HANDBOOK, NUCLEAR PHYSICS AND REACTOR THEORY VOLUME 1 OF 2 at 31-32 (Jan. 1993).

[66] Currently there is no national repository for high-level radioactive waste. *See infra*, note 107.

[67] *Backgrounder on Decommissioning Nuclear Plants*, *supra* note 62 (follow "Phases of Decommissioning" hyperlink; then scroll to "Commission Status for Shut Down NRC-Licensed Power Reactors (as of May 2015)).

[68] *Backgrounder on Decommissioning Nuclear Power Plants, supra* note 62.

[69] For example, Pacific Gas & Electric's (PG&E) Humboldt Bay Power Plant Unit 3 in Eureka, California permanently ceased its nuclear operations in 1976. The plant had two natural gas generating units attached to the shutdown nuclear unit. For over thirty years, the natural gas plant operators safely maintained the "mothballed" nuclear plant and its spent fuel in the spent fuel pool in compliance with NRC regulations. Only in 2007, with PG&E's building of an ISFSI, did major decommissioning activities commence, and the spent fuel was transferred to the ISFSI in 2008. *See Humboldt Bay*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/info-finder/decommissioning/power-reactor/humboldt-bay-nuclear-power-plant-unit-3.html (last visited Dec. 23, 2016).

under SAFSTOR (depending on the radiation levels of the portions of the plant).[70]

Finally, the last decommissioning strategy that a licensee may employ is ENTOMB. The prominent feature of ENTOMB is that the licensee encases the radioactive components in "structurally sound material," like concrete and rebar.[71] No licensees have ever requested that the NRC approve, in its PSDAR, an ENTOMB strategy.[72] Although ENTOMB could be an effective way of decommissioning, licensees have not employed ENTOMB because "they don't want to deal with the long term liability. And most nuclear plants are built on valuable waterfront property, so the public generally wants to reclaim the sites as soon as possible." [73]

B. Amending the License for Decommissioning

As decommissioning activities progress, the plant's license and license basis must still be maintained throughout the process, which is permitted to take up to sixty years.[74] A plant's license basis is usually made up of the following NRC approved documents: the Final Safety Analysis Report (FSAR), Emergency Plan, Physical Security Plan, Fire Protection Plan, and a Quality Assurance Plan.[75]

The FSAR is a very large document that outlines potential credible hazards and events — earthquake, flooding, and fires, for example—and ways that the licensee will mitigate and respond to those events.[76] The FSAR also outlines the management of the plant and specifies Structures, Systems, and Components (SSCs) that are

---

[70] *Backgrounder on Decommissioning Nuclear Plants*, *supra* note 62.

[71] *Id.*

[72] *Id.*

[73] Lisa Song, *Decommissioning a Nuclear Plant Can Cost $1 Billion and Take Decades,* INSIDE CLIMATE NEWS (June 13 2011), http://insideclimatenews.org/news/20110613/decommissioning-nuclear-plant-can-cost-1-billion-and-take-decades.

[74] 10 C.F.R. § 50.82(3) (2014).

[75] 10 C.F.R. § 50 (2015); 10 C.F.R. 50 § App. E (2015); 10 C.F.R. § 73.55 (2012); 10 C.F.R. § 50 App. R (2012).

[76] *See generally* 10 C.F.R. § 50, App. E; 10 C.F.R. § 50.54 (Conditions of License).

"Important-to-Safety" or "Safety-Related."[77] If an Important-to-Safety or Safety-Related SSC is affected or non-operable during operations, the whole plant may need to shut down to repair that SSC.

Additionally, each plant has an Emergency Plan, which outlines various responses by plant personnel to natural disasters experienced at the site.[78] Emergency Plans are NRC-approved plans that provide for the designated response procedures that the plant will undertake during an emergency, which may include responses to a contaminated injured person, fire, earthquake, loss of certain crucial equipment, security events, and others.[79] Plants are also required to conduct periodic drills, testing its emergency response plan, and the NRC may either observe the drill on an inspection or review the results.[80] Plants are required to report any qualifying emergencies to the NRC after notifying local and state officials, no more than one hour after the recognition and designation of the emergency by the licensee.[81]

Because each active and decommissioning plant is considered critical infrastructure and a likely terrorist target due to it possessing

---

[77] [T]his term applies to systems, structures, components, procedures, and controls (of a facility or process) that are relied upon to remain functional during and following design basis events. Their functionality ensures that key regulatory criteria, such as levels of radioactivity released, are met. Examples of safety-related functions include shutting down a nuclear reactor and maintaining it in a safe-shutdown condition.

Safety Related, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/reading-rm/basic-ref/glossary/safety-related.html (last visited Dec. 23, 2016).

[78] 10 C.F.R. § 50 App. E (2015).

[79] *Id.*; *see also* 10 C.F.R. § 50.47 (2013).

[80] 10 C.F.R. § 50.47 (2013).

[81] *See* Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants (NUREG 0654/FEMA-Rep-1, Revision 1), at 1-3; *see also Emergency Classification,* U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/about-nrc/emerg-preparedness/about-emerg-preparedness/emerg-classification.html (last visited Dec. 23, 2016). There are four classifications for licensees to declare qualifying emergencies (from low to high): Notification of Unusual Event ("NUE"); Alert; Site Area Emergency; and General Emergency. *Id.* Because decommissioning plants are not operating, their risks are inherently lower; thus their emergency plans usually only involve NUEs and/or Alerts.

radioactive spent nuclear fuel, and because a long-term storage solution has not been federally approved yet, each site must have a Physical Security Plan (PSP).[82] A plant's PSP is designated "Safeguards Information" (SGI), and in the interest of national security, it is not available to the public for review.[83] Due to the events of September 11, 2001, the NRC issued Interim Compensatory Measures (ICMs) in 2002 (which are SGI) to ensure that decommissioning facilities are protected against similar events.[84] The ICMs for decommissioning plants included more robust requirements for the physical security than 10 C.F.R. § 73.55 (with exemptions) called for. [85]

---

[82] 10 C.F.R. § 73.55. For ISFSIs with a 10 C.F.R. § 72 license, see 10 C.F.R § 73.51 (2001).

[83] SGI means

> information . . . which specifically identifies a licensee's . . . detailed control and accounting procedures for the physical protection of special nuclear material in quantities determined by the Commission through order or regulation to be significant to the public health and safety or the common defense and security; detailed security measures (including security plans, procedures, and equipment) for the physical protection of source, byproduct, or special nuclear material in quantities determined by the Commission through order or regulation to be significant to the public health and safety or the common defense and security; security measures for the physical protection of and location of certain plant equipment vital to the safety of production or utilization facilities; and any other information within the scope of . . .the Atomic Energy Act of 1954 . . . the unauthorized disclosure of which, as determined by the Commission through order or regulation, could reasonably be expected to have a significant adverse effect on the health and safety of the public or the common defense and security by significantly increasing the likelihood of sabotage or theft or diversion of source, byproduct, or special nuclear material.

10 C.F.R. § 73.2 (2015).

[84] Issuance of Order for Interim Safeguards and Security Compensatory Measures, U.S. NUCLEAR REG. COMM'N (May 23 2002), http://www.nrc.gov/reading-rm/doc-collections/enforcement/security/2002/decom-order-5-23-02.pdf; *see also* Order Modifying Licenses (Effective Immediately), U.S. NUCLEAR REG. COMM'N (Oct. 16, 2002), http://pbadupws.nrc.gov/docs/ML0228/ML022870008.pdf.

[85] The nature of this is SGI, but most decommissioning plants received exemptions from 10 C.F.R. § 73.55 once the nuclear power plant permanently

These documents, along with the plant's NRC issued license and technical specifications document,[86] form the plant's licensing basis. Any "change, test, experiment, or activity" (CTEA) to the plant and/or plant procedures must be screened against its license and license basis documents (like the Emergency Plan, for example) pursuant to 10 C.F.R. § 50.59, to ensure ongoing compliance with the regulations as procedures are changed.[87] This includes all seemingly minor changes because even a minor change or revision to a plant component or procedure may violate a license-based document, which in turn violates the license.[88]

Thus, when a plant shuts down and initiates the decommissioning process, one can imagine a "moving target" of keeping the licensing basis in compliance with NRC regulations. Every time a component is removed, or job responsibilities are changed or eliminated, a 50.59 screen must be performed. The NRC permits licensees to make changes to the plant site without the NRC's permission if the CTEA "screens out"—meaning that all licensing documents have been checked, and the CTEA has no impact to the licensing basis.[89] The licensee must keep a record of all CTEAs that have "screened out" for NRC review.[90] If the CTEA is critical to decommissioning and the CTEA "screens in," the licensee *must seek permission from the*

---

ceased operations. The ICM implemented stronger security requirements than what the decommissioning power plants were employing at the time.

[86] The "Tech Specs" outline the operating parameters the licensee may operate regarding certain equipment as prescribed by the NRC; *see generally Standard Technical Specifications – Operating and New Reactors – Current Versions*, U.S. NUCLEAR REG. COMM'N, *https*://www.nrc.gov/reactors/operating/licensing/techspecs/current-approved-sts.html (last visited Jan. 11, 2017).

[87] 10 C.F.R. § 50.59. The ISFSI-equivalent regulation for licensees screening its procedure changes against its license and license-basis documents is 10 C.F.R. § 72.48 (2001).

[88] The license usually has a catch-all clause that the licensee "shall follow all licensee approved procedures;" so if the licensee violates its own procedure where the procedure called for more stringent requirements than the license itself, the licensee still violates its license.

[89] If there is no impact on the licensing basis, the licensee may proceed with the CTEA without NRC approval. 10 C.F.R. § 50.59.

[90] 10 C.F.R. § 50.59(4)(d)(1). The licensee shall also submit a report to the NRC of all 50.59 activities that were screened in the past 24 months. 10 C.F.R. § 50.59(4)(d)(2).

NRC to conduct the CTEA, usually through a License Amendment Request (LAR).[91]

In order to get approval from the NRC, licensees may cite prior precedent created by the NRC by other similar plants progressing through decommissioning in their LAR. Additionally, licensees may express that the activity is crucial to the decommissioning process, that their site is unique, and the CTEA is critical to conduct to facilitate decommissioning. For example, PG&E's Humboldt Bay Power Plant (HBPP) was the only subterranean reactor in the United States.[92] The plant was designed this way due to its location in northern California, where earthquakes are frequent.[93] Thus, when decommissioning the reactor, PG&E submitted a LAR to the NRC to take apart the subterranean reactor and create a groundwater-tight retaining wall around the reactor cavity so that radioactive contamination would not leech out and effect the surrounding environment during decommissioning.[94]

Moreover, decommissioning is not all about dismantling and demolishing buildings. In fact, at the HBPP decommissioning, many buildings were *added* to the small eleven-acre site to help facilitate the decommissioning process, including a ground water treatment system, semi-truck scales and radioactive monitors, a solid waste processing facility, a radioactive counting building, and an ISFSI.[95] All of these buildings were screened for licensing impact per 10 C.F.R. § 50.59 and 10 C.F.R. § 72.48, and the plant's FSAR was updated accordingly to reflect the new buildings and the analysis for potential hazards and responses to hazards on the site, if applicable.

---

[91] *See* 10 C.F.R. § 50.90.

[92] *See* S. Pinto, *A Survey of the Underground Siting of Nuclear Power Plants* 2–5 (December 1979), http://www.iaea.org/inis/collection/NCLCollectionStore/_Public/13/653/13653623.pdf.

[93] David Oppenheimer, *Mendocino Triple Junction Offshore Northern California*, US GEOLOGICAL SERV., http://woodshole.er.usgs.gov/operations/obs/rmobs_pub/html/mendocino.html (last visited Dec. 23, 2016).

[94] Through the License Termination Plan Process, PG&E sent letters ML14246A157, ML14246A158, ML14246A159 to the NRC; the NRC issued a license amendment on May 4, 2016 (NRC Letter No. ML15090A339).

[95] Adding a 10 C.F.R. § 72 ISFSI along with a decommissioning Part 50 plant adds complexities to decommissioning on its own. Further discussion *infra*.

CTEAs, 50.59 screens, exemption requests, and LARs for decommissioning plants are a fact of life, since operating plant regulations under 10 C.F.R. § 50 do not really fit a decommissioning plant's situation.[96] For example, once a plant permanently ceases power operations, "vital areas" at the plant are eliminated, and security requirements are relaxed because a decommissioning plant poses less of a public threat than an operating plant.[97] In this case, a licensee would submit its amended Physical Security Plan (PSP) to the NRC for approval in anticipation of the upcoming plant changes to reduce security and manpower, ultimately saving money. The best way for efficiency by the licensee is to anticipate major developments and projects within the decommissioning process, and submit the LAR to the NRC well ahead of time in order for the NRC to review and ask the licensee questions on the certain activity—called a Request for Additional Information,(RAI).

C. Major Decommissioning Activities: "Cold and Dark"

Ninety days after the licensee submits its PSDAR, the licensee may start on major decommissioning activities at the plant site.[98] These activities "include permanent removal of such major components as the reactor vessel, steam generators, large piping systems, pumps, and valves."[99] However,

> [a]ctivities conducted without specific prior NRC approval must not prevent release of the site for possible unrestricted use, result in there being no reasonable assurance that adequate funds will be available for decommissioning, or cause any

---

[96] Recall that 10 C.F.R. § 50 contain the series of regulations for "Domestic Licensing of Production and Utilization Facilities." Therefore, once a plant permanently ceases power operations, the plant is still subject to these regulations even though the regulations are designed and meant for power generating facilities. Thus, the decommissioning plant is in a somewhat state of regulatory limbo before it obtains certain exemptions from the NRC.

[97] A decommissioning plant will be less radioactive and have less electrical hazards than a power-generating plant because the decommissioning plant is no longer generating nuclear power via the fission process.

[98] *Backgrounder on Decommissioning Nuclear Plants*, *supra* note 62.

[99] *Id.*

> significant environmental impact not previously reviewed. If any decommissioning activity does not meet these terms, the licensee is required to submit a license amendment request, which would provide an opportunity for a public hearing.[100]

To start major decommissioning and dismantling the plant, the plant must go to a "cold and dark" status—where major components are de-energized and isolated from the main plant power. This means that the electricity in buildings that are being dismantled is routed from an external source, rather than the building's electrical wiring. Since the building itself does not have power, this increases the safety of the workers that are decontaminating and deconstructing the building's walls.

Increased truck traffic likely occurs on the site. The lower level radioactive components and soil are surveyed by RP technicians and loaded on semi-trucks, bound for waste facilities like U.S. Ecology's facility in Grand View, Idaho or Energy Solutions' disposal site in Clive, Utah. These low-level radioactive waste facilities, in addition to the processing and transport of radioactive waste, are also subject to NRC regulations.[101] If the shipment of waste is at a higher threshold level of radioactivity, a security plan for the truck and the truck's route must be filed with the recipient state, as well as the state highway patrol agencies along the designated route.[102]

Additionally, as some plant personnel may be laid off due to decommissioning, RP technicians and "deconners" gain employment as the majority of the work at the site is for the decontamination and disposal of the plant's building and components. Title 10, Code of Federal Regulations, section 20, "Standards for Protection Against Radiation"[103] set the federal limits of radiation dose to the public and employees at the site and governs and regulates radiation protection. Plants generally utilize an Offsite Dose Calculation Manual (ODCM) to determine potential dose rates to the public in certain postulated situations and to make sure federal limits are not exceeded during the project.

---

[100] *Id.*

[101] *See* 10 C.F.R. § 71 for packaging and transport regulations.

[102] 10 C.F.R. § 71; *See also* 49 C.F.R. § 172(I).

[103] 10. C.F.R. § 20.

At some stage of a plant's decommissioning, the licensee submits a License Termination Plan (LTP) to the NRC.[104] The LTP is an NRC-approved plan of how the licensee will achieve a satisfactory state including plans for site remediation, a description of the land's use at the end of decommissioning, and costs of decommissioning, to name a few.[105] License termination is a joyous day for the licensee because, so long as the licensee possesses a license, the licensee must continue to pay the NRC fees for the license itself and for yearly inspections.[106] Although licensees may be able to decommission and submit applications for their license to be terminated, there will likely be some highly radioactive waste from the decommissioning that has no where to be disposed, like Greater Than Class C Waste (GTCC).[107] Thus, so long as licensees have no where to dispose of the spent nuclear fuel and the GTTC waste, it seems that licensees of current reactors will always hold an NRC license unless Congress finally offers a solution to the spent nuclear fuel and GTCC waste repository issue.

D. Construction of an ISFSI out of Necessity

To deal with the issue of the accumulating spent nuclear fuel at commercial power plants, Congress enacted the Nuclear Waste Policy Act of 1982 (NWPA).[108] The NWPA assigned the responsibility of a geological repository for commercial nuclear plant's spent fuel to the DOE.[109] The NWPA provided that utility licensees pay fees into a fund, the Nuclear Waste Fund, to help

---

[104] See *Decommissioning Process,* NUCLEAR REG. COMM'N, https://www.nrc.gov/waste/decommissioning/process.html (last visited Jan. 11, 2017).

[105] *Id.*

[106] *See, supra* note 15, where NRC recovers 90% of its annual budget each fiscal year.

[107] The highest level of radioactive waste, it is usually components that have come into close contact from the irradiation process, like internals from the reactor core. As of this writing, there is no place to dispose of this high level of waste in the U.S. *See Greater Than Class C and Transuranic Waste*, U.S. NUCLEAR REG. COMM'N, https://www.nrc.gov/waste/llw-disposal/llw-pa/gtcc-transuranic-waste-disposal.html (last visited Jan. 11, 2017).

[108] *See generally* 42 U.S.C. §§ 10101-10108 and Subchapters I-V.

[109] *Id.*

construct the national repository.[110] In 1987, the NWPA was amended to state that the national repository would be located in Yucca Mountain, Nevada,[111] approximately ninety miles northwest of Las Vegas. The DOE entered into an agreement with the commercial nuclear power plant licensees to take possession of the spent fuel on or before January 31, 1998.[112] Because the government has not taken possession of the spent fuel from decommissioned commercial nuclear plants, utilities have successfully sued the DOE every three years to recoup funds for the expense of storing the spent fuel on its site, as well as the building, staffing, and maintenance of the ISFSI.[113]

The Yucca Mountain project has been on hold due to politics,[114] NIMBY,[115] and fiscal restraints by Congress.[116] However, since the Fukushima Daiichi incident in 2013, those states' U.S. Senators who have nuclear plants in seismically active areas on coastlines are now especially concerned with long-term nuclear fuel storage stored locally at the site.[117]

---

[110] *Id.*

[111] 42 U.S.C. § 10172 (2012).

[112] *Id.* § 10222(a)(5)(b).

[113] *See* Todd Garvey, Cong. Research Serv., R40996, THE YUCCA MOUNTAIN LITIGATION: LIABILITY UNDER THE NUCLEAR WASTE POLICY ACT OF 1982 at 1 (2009). As of 2009, licensees have successfully sued the government for $1.2 billion in damages; one can imagine that the total may be double that due to the constructions of ISFSIs across the country. *Id.*

[114] Senator Harry Reid (D) from Nevada, along with other Nevada politicians, have opposed the repository in the state. *See* Stewart and Stewart, *Article: Solving the Spent Nuclear Fuel Impasse*, 21 N.Y.U. Envtl. L.J. 1, 9 (2014); *See also* Hannah Northey, GAO: *Death of Yucca Mountain Caused by Political Maneuvering*, NEW YORK TIMES (May 10 2011), http://www.nytimes.com/gwire/2011/05/10/10greenwire-gao-death-of-yucca-mountain-caused-by-politica-36298.html?pagewanted=all (last visited Jan. 11, 2017).

[115] "Not In My Backyard."

[116] *See* Alex Funk & Benjamin K. Sovacool, *Wasted Opportunities: Resolving the Impasse in United States Nuclear Waste Policy*, 34 Energy L. J. 113 (2013)

[117] *See, e.g.* Edward Sifuentes, *Local Cites Asked to Back Nuclear Fuel Bill*, SAN DIEGO UNION-TRIBUNE (Jan. 18 2016), http://www.sandiegouniontribune.com/news/politics/sdut-oceanside-spent-nuclear-fuel-bill-2016jan18-story.html (last visited Jan. 11, 2017).

E. Licensing the ISFSI

Technically, a licensee need not construct an ISFSI if it feels that long-term storage in a Spent Fuel Pool (SFP) is sufficient. A licensee may desire to select this method if it has numerous units at a site, with only one in a decommissioning phase. For example, the aforementioned Millstone nuclear power plant has three units—two are fully generating nuclear power (Units 2 and 3) and Unit 1 is in SAFSTOR status. The spent fuel from Unit 1 is stored in a SFP, where the licensee plans to store it until 2048.[118]

However, if all units at the plant site are permanently shut down, the licensee will likely need to construct and license an ISFSI at some point so that the fuel may be moved out of the SFP into dry cask storage to facilitate decommissioning. A licensee may elect to store the spent fuel for an adequate time period while the fuel cools off and the residual radioactivity of the plant decays, or the license may want to just meet the typical five year cool off period before moving the fuel to a dry cask system. According to the NRC, the industry norm is ten years, but it has approved fuel moves with a three-year cool off period.[119]

The demineralized water in the SFPs serves to both cool the fuel rods and act as a radiation shield.[120] SFPs are typically forty feet deep, are lined with stainless steel, and are reinforced by several feet of concrete.[121] SFPs at a Boiling Water Reactor[122] are typically housed in the Fuel Handling Building within the plant's containment building, which is another structure made of several feed of concrete

---

[118] *Millstone Unit 1*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/info-finder/decommissioning/power-reactor/millstone-unit-1.html (last visited Dec. 22, 2016).

[119] *Spent Fuel Storage in Pools and Dry Casks, Key Points and Questions & Answers*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/waste/spent-fuel-storage/faqs.html (last visited Dec. 23, 2016).

[120] *Id.*

[121] *Id.*

[122] In the United States, there are two styles of NRC approved reactors: BWRs (older style) and PWRs. *Power Reactors*, NUCLEAR REG. COMM'N, https://www.nrc.gov/reactors/power.html (last visited Jan. 11, 2017).

and rebar.[123] In a Pressurized Water Reactor, the SFPs are housed outside of containment in a separate building. In any event, public concern for spent fuel in an SFP is usually prompted by the age of the nuclear plant and the local geology—more specifically if the site is in a seismically active area. For example, HBPP in Eureka, California permanently shut down in 1976. HBPP likely kept its nuclear fuel in an SFP for a couple of reasons: 1) dry storage technology did not exist, or was not too advanced in the 1980s, and 2) the plant had two full service natural gas units attached to the nuclear Unit 3, which complicates full scale decommissioning. Moreover, as HBPP lay within the Mendocino Triple Junction subduction zone fault area,[124] the public was concerned with HBPP's storage of spent nuclear fuel in a SFP, especially with a 250 foot cooling tower looming above the building that housed the SFP.[125] Due to this concern, licensee PG&E removed the cooling tower in 1998, built a subterranean ISFSI in 2007, and moved the spent fuel to the ISFSI in 2008, providing for a much safer and secure site to decommission for its employees and the surrounding public.[126]

Those plants that permanently cease power operations are still licensed pursuant to 10 C.F.R. § 50, the operating license section of the code, until the license is terminated.[127] Thus, a licensee may construct an ISFSI without needing to apply for a new license—but consequently, once the spent nuclear fuel is transferred to the ISFSI, the ISFSI will be subject to 10 C.F.R. § 50 regulations, and thus become a General License ISFSI. Because 10 C.F.R. § 50 applies to operating nuclear plants, many of its security and emergency regulations do not make sense for an ISFSI, which is a passive

---

[123] *See* Nat'l Academy of Sciences, Safety and Security of Commercial Spent Nuclear Fuel, April 6, 2005, Chapter 3, Figure 3.1, (for BWR) and Figure 3.2 (for PWR), http://www.nirs.org/reactorwatch/security/nasrptsfp5.pdf.

[124] Oppenheimer, *supra* note 93.

[125] Rand Herbert & Garret Root, *Photographs Written Historical And Descriptive Data Field Records*, HISTORIC AMERICAN ENGINEERING RECORD HUMBOLDT BAY POWER PLANT HAER NO. CA-2293 (2012). http://lcweb2.loc.gov/master/pnp/habshaer/ca/ca3800/ca3878/data/ca3878data.pdf.

[126] *See Learn the History of the PG&E Humboldt Bay Power Plant*, PACIFIC GAS & ELECTRIC CO., https://www.pge.com/en_US/about-pge/environment/what-we-are-doing/buildings-and-operations/humboldt-bay-power-plant.page?WT.mc_id=Vanity_humboldtbay (last visited Jan. 11, 2017).

[127] *See supra* Section III, Part C.

storage system. Thus, to relieve itself of regulatory burden, the licensee must submit numerous license exemption requests and LARs, which in turn creates a logjam of work for the NRC.[128] The NRC must review and analyze the requested exemptions to ensure that the approval will not result in adverse public health and safety consequences.[129]

Although the 10 C.F.R. § 50 requirements are akin to a "square peg in a round hole," in application to an ISFSI, licensees may prefer this because it avoids the alternative—applying for a new license under 10 C.F.R. § 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste."[130] Applying for a new license can take a long time, and a new license likely require public hearings and comment periods.[131] Licensees may not want to expose themselves to public comment periods to protect its public image, and the public comment may be unpredictable, resulting in new orders from the NRC on how the utility should construct the ISFSI depending on the public outcry. In the United States, there are fifty-six General License ISFSIs, and fifteen Part 72 (Specific License) ISFSIs.[132] It should be noted, however, that the majority of the General License ISFSIs are co-located at operating reactor sites.[133]

Because a Specific License ISFSI requires a new license, the utility licensee must go through the application process through the NRC. As stated previously, this exposes the utility licensee to public comment and hearings. Because this is a new license, the licensee must submit a proposed FSAR, Physical Security Plan, Emergency Plan, Fire Protection Plan, and other licensing basis documents for the ISFSI itself. Utilities applying for a specific license are likely in the situation where its fuel is located in the SFP under 10 C.F.R. § 50 requirements, so there will be some overlap while the licensing

---

[128] *See generally* 10 C.F.R. § 50.90 (2007).

[129] 10 C.F.R. § 50.91 (2007).

[130] 10 C.F.R. § 72 (2015).

[131] 10 C.F.R. § 72.46 (2000).

[132] *U.S. Independent Spent Fuel Storage Installations*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/waste/spent-fuel-storage/map-fuel-storage-facilities.pdf (last visited Dec. 23, 2016).

[133] *Id.*

process takes place. For example, a utility in the aforementioned situation would likely submit its existing Emergency Plan that envelopes the proposed on-site ISFSI—so the one document would cover the two licensed facilities. These efforts notwithstanding, Specific License ISFSIs enjoy a clearer regulatory scheme under 10 C.F.R. § 72 than 10 CFR 50, because 10 C.F.R. § 72 is *specifically* tailored to independent spent fuel storage, whereas 10 C.F.R. § 50 is tailored to operating nuclear plants. The physical design of ISFSIs can vary—the most popular being above-ground casks (somewhat looking like "space pods") bolted down to a concrete pad, with security fencing, intrusion detection, and a vehicle barrier system surrounding the casks.[134] There is also a mausoleum style ISFSI, as seen at San Onofre ISFSI, in Oceanside, California, as well as Rancho Seco in Herald, California.[135] Additionally, in light of the public's increased earthquake and tsunami concerns after the Fukushima Daiichi event, ISFSIs like Humboldt Bay and Callaway (in Reform, Missouri) have constructed subterranean ISFSIs, which further protect against those postulated hazards.[136] Subterranean ISFSIs may also protect the utility licensees from future regulation compliance challenges as the NRC continues to respond to climate change and security concerns by way of increased promulgation of regulations.[137]

F. ISFSI Operations

The moment the first dry cask is loaded into the ISFSI, the ISFSI is considered operational and must adhere to its applicable regulations and its license conditions. The ISFSI and its dry casks are passive storage systems. The internal canister is usually filled with spent nuclear fuel in a certain pattern to inhibit any formation of

---

[134] *See*, *e.g. Stranded Fuel: The Casks Stand Alone*, FRIENDS OF PLEISTOCENE (Mar. 7, 2012, 11:21 am), https://fopnews.wordpress.com/2012/03/07/stranded-fuel-the-casks-stand-alone/. The photographs help to depict the descriptions.

[135] *Id.*

[136] Enformable Nuclear News, *Holtec President says HI-STORM Dry Storage Casks can last 300 years,* ENFORMABLE (June 27, 2015), http://enformable.com/2015/06/holtec-president-says-hi-storm-dry-storage-casks-can-last-300-years (last visited Jan. 11, 2017).

[137] *See* 10 C.F.R. § 73.51 (2001).

critical mass.[138] The canister is then filled with helium, an inert gas that further helps with the passive cooling and transfer of heat to outside of the canister.[139] The canister is then put into an "overpack."[140] This is another canister that has two to three inches of concrete and can withstand "high-impact crashes, high temperatures, and bullets."[141] The president of Holtec, a major player in the dry cask storage industry, stated that the cask could last for 300 years.[142]

Once a nuclear plant permanently ceases power operations, the nuclear operator workforce is reduced accordingly. Since an ISFSI is a passive system, trained and qualified nuclear plant operators are not necessary to "operate" the ISFSI. However, one personnel element at the ISFSI will always be necessary so long as the ISFSI contains spent fuel: security personnel.[143] Thus, to save on labor costs, the earliest ISFSIs in the northeastern United States added operating the ISFSI to security personnel's responsibilities.[144] Up until then, only trained and qualified nuclear plant operators had operated nuclear facilities, as was required by 10 C.F.R. § 50.[145]

ISFSI security personnel have two important jobs: 1) to protect the ISFSI from acts of terrorism and sabotage and 2) to "operate" the ISFSI.[146] Operating the ISFSI amounts to preventative maintenance and conducting surveillances pursuant to the ISFSI's technical specifications and license.[147] Conducting security at the ISFSI usually includes patrolling the ISFSI area, manning an alarm station and responding to alarms, and conducting searches on vehicles and

---

[138] Michele Sampson, *Dry Cask Storage – The Basics*, (March 12, 2015), U.S. NUCLEAR REG. COMM'N, https://public-blog.nrc-gateway.gov/2015/03/12/dry-cask-storage-the-basics/.

[139] *Id.*

[140] Enformable Nuclear News, *supra* note 136.

[141] *Id.*

[142] *Id.*

[143] *See* 10 C.F.R. § 73.51(d) (2001).

[144] Yankee Rowe, Maine Yankee, and Connecticut Yankee, together the 3 Yankee plants.

[145] *See* 10 C.F.R. § 50 (2015).

[146] 10 C.F.R. § 73.5; *see also* 10 C.F.R. § 72 Subpart C (Issuance and Conditions of License).

[147] *Id.*

personnel that enter the ISFSI.[148] Preventative maintenance on the ISFSI may include: recording the temperatures in the ISFSI vault cells where the cask resides, or within the cask itself; controlling vegetation growth for fire protection considerations; shoveling snow; and testing security equipment periodically to ensure proper standards.[149] At power-generating and decommissioning plants, many of the maintenance and operational duties are left up to those respective departments because those departments are still fully staffed. But at a stand-alone ISFSI, ISFSI personnel are cross-trained to perform a wide variety of assignments due to budget concerns by the licensee, and in turn, the DOE.[150] Since security personnel are mandated to be at the site twenty-four hours a day, seven days a week, [151] it was a logical step to train them in ISFSI operational tasks after decommissioning activities have ceased.

But can these additional duties detract from security personnel's mission of preventing radioactive sabotage? Licensees should strike a balance between security personnel's main function and its ancillary duties, such as licensing, emergency plan procedure writing, conducting preventative maintenance. According to 10 C.F.R. § 73.51(d)(5):

> A security organization with written procedures must be established. The security organization must include sufficient personnel per shift to provide for monitoring of detection systems and the conduct of surveillance, assessment access control, and communications to assure adequate response. Members of the security organization must be trained, equipped, qualified, and requalified to perform assigned job duties in accordance with appendix B to part 73, sections I.A. (1)(a) and (b), B(I)(a), and the applicable portions of II.[152]

---

[148] *See* 10 C.F.R. § 73.51 (2001).

[149] *See* 10 C.F.R. § 72 Subpart C (2001).

[150] Since ISFSIs do not generate income, they have a strict budget to adhere to, and the DOE may not reimburse any unreasonable costs in litigation for the DOE's failure to take the spent nuclear fuel.

[151] *See* 10 C.F.R. § 73.51 (2001).

[152] 10 C.F.R. § 73.51(d)(5) (2001).

In response to the events of September 11, 2001, the NRC issued emergency orders in May 2002 (order modifying license) to all sites to bolster their security-force personnel and the physical systems.[153] Since operational nuclear plants are more robust under 10 C.F.R. § 73.55 regulations, their security requirements were not as significantly affected as those plants decommissioning and those sites that were stand-alone ISFSIs.[154] ISFSIs and decommissioning plants had until November 2002 to achieve compliance with the order.[155]

These Interim Compensatory Measures (ICMs) continue to drive decommissioning and ISFSI security today. Although details of the ICMs cannot be revealed in this article, due to its Safeguards Information designation, it can be very confusing for a facility to be "regulated by order" rather than the actual promulgated Code of Federal Regulations under Title 10. The NRC should take it upon itself to finally codify these ICMs as regulations, to eliminate any confusion of how licensees can comply. Although the spirit of ICMs are "interim," meaning they could be rescinded at any time, the ICMs are not likely to be rescinded, especially with today's climate of terrorism in America and the world. Thus, like the Department of Homeland Security's dated color-coded Homeland Security Advisory System, where the color "green" (low chance of terrorism) is realistically nonexistent,[156] these ICMs should be codified permanently to eliminate confusion and embrace the reality of the uncertainty of today's world in regards to decommissioning reactor and ISFSI security.

---

[153] Martin J. Virgilio, *Order Modifying License*, NRC.GOV (May 23, 2002), http://www.nrc.gov/docs/ML0210/ML021080507.pdf.

[154] 10 C.F.R. § 73.55 (2012).

[155] Virgilio, *supra* note 153.

[156] *See* Homeland Security Advisory Council, *Homeland Security Advisory System Task Force Report and Recommendations*, DHS.GOV (Sept. 2009), https://www.dhs.gov/xlibrary/assets/hsac_final_report_09_15_09.pdf. From 2002-2009, the timeframe in which the Department of Homeland Security utilized the four level color-coded system, it never lowered the threat level to "Low" (Green) or "Guarded" (Blue). *Id.* The DHS eventually eliminated the color-coded system in April 2011. *Chronology of Changes to the Homeland Security Advisory System*, DHS.GOV, https://www.dhs.gov/homeland-security-advisory-system (last updated June 21, 2016).

Comparing 10 C.F.R. § 73.51 with 10 C.F.R. § 73.55, a couple of salient issues arise.[157] Incredibly, ISFSI personnel are not subject to 10 C.F.R. § 26 Fitness for Duty (FFD) regulations, whereas 10 C.F.R. § 73.55 security personnel (decommissioning and operating nuclear plants) are.[158] FFD programs typically include periodic random drug testing on plant personnel, as well as an alcohol and an exhaustive screening procedure for any employee that is called out unscheduled to report to the job site for work.[159] The NRC should amend its regulations and include ISFSIs in 10 C.F.R. § 26 requirements to instill public confidence in those personnel tasked with the important job of keeping the ISFSI safe and secure.[160]

Additionally, power-generating nuclear plants security force that are subject to 10 C.F.R. § 73.55 are also subject to Force-on-Force drills,[161] where the NRC effectively employs a tactical team to infiltrate the nuclear plant to test the security force's response.[162] Decommissioning plants with fuel in the SFP and ISFSIs are currently not subject to Force-on-Force drills.[163] It makes fiscal and practical sense to not have ISFSIs participate in Force-on-Force drills because the drills can last numerous days, the inspections themselves are costly in time and money, and the robust nature of the dry storage casks limit the postulated probable damage that a terror attack could do.[164] On the other hand, those facilities that store their spent nuclear fuel in SFPs should be subject to Force-on-Force drills. Most facilities utilizing SFPs as long term storage are already subject to Force-on-Force drills because they have co-located nuclear generating units, so it would be a non-issue for them. However, those stand-alone decommissioning plants utilizing SFPs should be subject to Force-on-Force drills because the storage of spent fuel in SFPs is inherently likely more at risk to safety and security than if it

---

[157] *Compare* 10 C.F.R. § 73.51 (2001), *with* 10 C.F.R. § 73.55 (2012).

[158] *See* 10 C.F.R. § 26.3(e) (2008).

[159] 10 C.F.R. § 26.31(b)(1)(i), (c)(3)(iii)(5) (2009).

[160] *See* 10 C.F.R. § 26.8 (2008).

[161] *Backgrounder on Decommissioning Nuclear Plants*, *supra* note 62.

[162] *Id.*

[163] *Id.*

[164] *See* Enformable Nuclear News, *supra* note 136.

were in dry cask storage.[165] The prospect of a Force-on-Force drill by the NRC at a SFP-only storage site, especially failing and paying for another drill, should be enough to expedite the licensee in pursuing the dry cask storage process to make the environment safer for the local community.

It is hard to say where the NRC will go with Force-on-Force drills, especially in regards to ISFSIs. If the NRC will require these in the future, licensees would then have to likely incur crippling costs of hiring more personnel to ensure compliance with a Force-on-Force order or regulation. This would be especially economically harmful to those ISFSI licensees that do not generate any income from power operations. Those ISFSI sites that are operating under a strict budget would additionally have to construct buildings to house the future new employees—a seemingly waste of monetary resources to those licensees who already dismantled their buildings during decommissioning.

Ultimately, the American taxpayer would be on the hook for the costs of these imposed regulations, as the cash-strapped licensee would simply sue the DOE for not taking possession of the spent fuel per the NWPA.[166] The licensee would likely prevail, but the legal fees would generate excessive costs to the taxpayer as well.[167] A remedy for this situation would be for a takeover of every ISFSI site by the DOE. In this way, the DOE could directly control and limit expenditures, like engineering and labor costs, instead of just reimbursing the utility every time the DOE is sued. This remedy would be ideal since the Yucca Mountain project's future is uncertain,[168] at least the DOE would make good on taking possession

---

[165] For example, because 10 C.F.R. § 73.51 and 10 C.F.R. § 72 require less security and safety requirements by the NRC than SFPs under 10 C.F.R. § 50, one would conclude that the NRC has reflected the level of safety and security risk in the respective regulations accordingly.

[166] *See* National Waste Policy Act of 1982, *supra* at Part H.

[167] Mark Fahey, *How the Department of Energy became a Major Tax Liability*, CNBC, July 6 2016, http://www.cnbc.com/2016/07/05/how-the-department-of-energy-became-a-major-taxpayer-liability.html (last visited Jan. 11, 2017).

[168] Christopher M. Keegan, Comment, *What's Worse, Nuclear Waste or the United States' Failed Policy For its Disposal?*, 49 U. RICH. L. REV. 1265, 1274 (2015) ("[T]he DOE's strategy [for management and disposal of used nuclear fuel and high level radioactive waste] does not mention Yucca Mountain at all, not even in an historical context.").

of the fuel and avoid the constant barrage of litigation costs incurred both by itself and the utility licensees.[169]

G.Multiple Licenses, Many Moving Parts

At some point in time, a decommissioning power plant licensee with a Specific License for an ISFSI, under 10 C.F.R. § 72, and a General (nuclear material possession-only) License for its decommissioning power plant, under 10 C.F.R. § 50, will have two licenses on one site. This challenges the licensee's compliance as many plant activities can overlap, and may even directly contradict the two licenses. For example, in an ISFSI FSAR, the FSAR may refer to a seismograph that the ISFSI relies upon to determine whether the ISFSI should initiate earthquake response procedures and facility inspections. But here, the seismograph is installed at the 10 C.F.R. § 50 decommissioning plant, and during its decommissioning activities, plant engineers determine that the seismograph is no longer needed for the plant. The engineers conduct a screen per 10 C.F.R. § 50.59, and find no impact to permanently taking out the seismograph for the plant. Thus, they dispose of the seismograph. The problem here is that the 10 C.F.R. § 72 ISFSI FSAR was relying on that equipment! Therefore, the licensee must be very careful in screening against both a 10 C.F.R. § 72 and 10 C.F.R. § 50 license bases because the ISFSI's license may have been issued by the NRC partially based upon the NRC's reliance that certain equipment or personnel under the 10 C.F.R. § 50 decommissioning plant would be available to the 10 C.F.R. § 72 ISFSI.

Decommissioning further became more challenging due to the promulgation of 10 C.F.R. § 37, "Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material," which became

---

[169] For example, recently the Dairyland Power Cooperative successfully sued the DOE for its spent fuel storage costs, obtaining a $73.5 million dollar settlement for six years of fuel storage. Chris Hubbuch, *Feds to Pay Dairlyland $73.5 million for nuke storage*, La Crosse Tribune, Oct. 21 2016, http://lacrossetribune.com/news/local/feds-to-pay-dairyland-million-for-nuke-storage/article_74f56192-afe9-5b08-a2d6-a5fbcea0698f.html (last visited Jan. 11, 2017).

effective March 2014.[170] The NRC, likely fearing the possibility of a "dirty bomb" made up of lower level radioactive sources (including medical sources at hospitals), promulgated these additional security regulations to further provide for the health and safety of the public.[171] Radiation Protection (RP) personnel need to ensure special care into not inadvertently creating Category 1 or 2 sources, usually by accidently combining enough radioactive sources to meet or exceed the designated threshold.[172]

Additionally, decommissioning plants have on-site calibration sources for RPs to calibrate their instruments when decontaminating the buildings. These calibration sources are subject to the 10 C.F.R. § 37 requirements if they exceed the designated thresholds in the regulation. Note that 10 C.F.R. § 37 is not a separate license; one usually possesses the radioactive material to meet category 1 or 2 under the 10 C.F.R. § 50 license.[173] Here, there is another round of required security procedures to protect the source from sabotage, including coordination with local law enforcement,[174] the establishment of Security Zones,[175] the maintenance and testing of the security equipment,[176] and reporting requirements to Local Law Enforcement Agencies (LLEA), and the NRC,[177] among others.

These requirements were much needed from the NRC, at least for hospital sources. As seen through different terrorist attacks through the years, like the Boston Marathon bombing and the mass shootings in San Bernardino, terrorists look for "soft targets"—those that are easy to take advantage of due to their lack of security and those areas that would maximize the terrorist's casualties. Any attack where

---

[170] *See Implementation Guidance for 10 CFR Part 37, "Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material"*, NUREG 2155, Rev 1, U.S. NUCLEAR REG. COMM'N (Jan. 2015), http://www.nrc.gov/docs/ML1501/ML15016A172.pdf. The NRC "considers category 1 and category 2 quantities of radioactive material to be risk significant, and these quantities refer specifically to 16 radioactive materials." *Id.* at 4.

[171] *Id.* at 198; *see also id.* at 205.

[172] *Id.* at 6; *see also* 10 C.F.R. § 37.5 (2013).

[173] *See generally* 10 C.F.R. § 37 (2013).

[174] 10 C.F.R. § 37.45 (2013).

[175] 10 C.F.R. § 37.47 (2013).

[176] 10 C.F.R. § 37.51 (2013).

[177] 10 C.F.R. § 37.57 (2013).

radioactivity would be involved would likely cause mass panic in America, even if the resulting radioactivity is inconsequential to one's health. Thus, the NRC's promulgation of 10 C.F.R. § 37 was a step in the right direction in regards to hospitals who possess radioactive sources. However, as applied to the decommissioning nuclear plant, 10 C.F.R. § 37 adds another layer of regulation for the licensee to comply with to avoid fines or penalties by the NRC. Because operating and decommissioning nuclear power plants and ISFSIs are not considered "soft targets," and because those sites have security personnel at all times, only time will tell if the 10 C.F.R. § 37 requirements will make a significant difference at these nuclear plant sites.

H. State and Public Involvement in Nuclear Regulation

It should be no surprise that in this arena, and overall, federal law preempts state law in regards to all aspects of the plant's federal license and overall nuclear plant regulation.[178] However, this does not mean that the licensee is not "off the hook" to local or state government and their agencies. Decommissioning plants are not only subject to jurisdiction of the NRC but are also subject to the jurisdiction of the local water and air board, the state public utilities commission, state coastal commission, city and county government, and others. As one can see, a decommissioning plant is a challenge to keep in compliance due to its constant state of flux, as opposed to the relative "groundhog days" experienced at an operational plant or ISFSI.[179]

---

[178] *See* U.S. CONST. art. VI, cl. 2 (the Supremacy Clause and the doctrine of field preemption).

[179] Because components and buildings at a decommissioning power reactor site are constantly being dismantled, or in some areas being built, the facility is in a state of flux. Compare this to an operating power plant, where daily power operations are usually routine. The most comparable event to a decommissioning power plant an operating plant experiences is a "refueling outage," where the licensee temporarily shuts the down power operations at a reactor to refuel. The licensee takes advantage of the power plant being offline to conduct critical maintenance it could not otherwise do while the plant is running. Some have said that a decommissioning project is like "one very long outage."

While it has been well settled that Federal law dictates in the arena of nuclear power,[180] this has not stopped states from challenging the NRC. From an objective view, one can understand that a state has a compelling interest in regards to nuclear power within the state because it is rightly concerned for the health and safety of its residents. Moreover, under Article X of the U.S. Constitution, a state has a right to regulate its people under its police power.[181] As most nuclear power plants reside on a coastline or waterway, the state has a substantial interest in keeping that waterway clean and safe for its people for economic and recreational purposes.[182]

The NRC, through its regulations and NUREG-1700,[183] has set forth reasonable standards depending on what the licensee plans to do with the land after the nuclear plant is decommissioned.[184] For example, if the licensee wants to immediately sell the land to developers after decommissioning because the land is prime real estate with a terrific ocean view, the land is subject to more rigorous standards up front for "free release." In contrast, if the licensee plans to use the land for its utility or industrial operations, or "restricted release," a lesser standard applies.[185]

An example of where a state circumvented federal and NRC jurisdiction in the nuclear field is the case *Pacific Gas & Electric Co. v. State Energy Research Conservation*.[186] Here, the California Legislature passed and enacted legislation, section 25524.1(b) of the

---

[180] *See* Atomic Energy Act of 1954, 42 U.S.C. §§ 2011-2021, 2022-2286(i), 2296(a)-2297(h).

[181] *See* U.S. CONST, art. X.

[182] Most nuclear plants rely on secondary cooling systems that cool the pipes that contain radioactive steam to condense that steam back to radioactive water. The water that makes up the secondary cooling systems is frequently from an ocean or river. That water is never contaminated by the radioactivity, so the water is discharged back to its original source (albeit 10-15 degrees warmer).

[183] U.S. NUCLEAR REG. COMM'N, *Standard Review Plan for Evaluating Nuclear Power Reactor License Termination Plans*, NUREG-1700, Rev. 1 (Mar. 2003), http://www.nrc.gov/docs/ML0312/ML031270391.pdf.

[184] *Id.*

[185] *Id.* However, with "restricted release," the licensee needs to meet certain land controls and financial assurance criteria for license termination. *Id.*

[186] 461 U.S. 190 (1983).

California Public Resources Code.[187] This section permitted the State Energy Resources Commission to determine on a case-by-case basis if there would be "'adequate capacity' for interim storage of the plant's spent fuel at the time the plant requires such storage."[188] Although the U.S. Supreme Court found that section 22524.1(b) was not ripe for judicial review, it did find that section 25524.2 was ripe for review.[189] Section 25524.2 provided for a moratorium on new nuclear plants in California until "the Energy Commission 'finds that there has been developed and that the United States through its authorized agency has approved and there exists a demonstrated technology or means for the disposal of high-level nuclear waste.'"[190] California utility companies Pacific Gas & Electric Company and Southern California Edison sued to challenge these statutes on the basis of federal preemption.[191]

The utility companies, along with the federal government, presented three arguments supporting federal preemption.[192] First, they argued that the statutes were constructed on the basis of safety and that the Atomic Energy Act created an express reservation of power for the federal government in this area.[193] Second, they argued that the statutes and decisions leading up to the Supreme Court conflicted with "decisions concerning the nuclear waste disposal issue made by Congress and the [NRC]."[194] Finally, the petitioners argued that this statutory scheme frustrated the federal goal of developing the field of nuclear energy.[195]

The Court analyzed the Atomic Energy Act's organic statute and found that there was no explicit language that barred a state from placing a moratorium on nuclear power plants.[196] In fact, the Court

---

[187] *Pacific Gas*, 461 U.S. at 190.

[188] *Id.*

[189] *Id.*

[190] *Id.* at 198.

[191] *Id.* at 200.

[192] Pacific Gas & Electric Co. v. State Energy Research Conservation, 461 U.S. 190, 204 (1983).

[193] *Id*.

[194] *Id.*

[195] *Id.*

[196] *Id.* at 218.

stated that the Atomic Energy Act's legislative history in Congress specifically reserved state authority.[197] The Court's test on preemption was "whether 'the matter on which the state asserts the right to act is in any way regulated by the federal government.'"[198] The Court found that the Federal government held preemption through nuclear safety, and in regards to other issues involving nuclear facilities, California's reasons for a moratorium were " largely economic or the result of poor planning, *not* safety related."[199] The Supreme Court held "that Congress left states sufficient authority to determine on economic grounds what kind of plant should be built and whether to prohibit construction of new nuclear plants indefinitely."[200]

In addition to states' involvement in the process, the public's role in the building of an ISFSI and decommissioning of a nuclear plant is crucial. Because the NRC is an administrative agency, it promulgates rules through informal rulemaking, also known as "Notice and Comment" rulemaking.[201] The NRC publishes the proposed rule in the Federal Register and the rule usually contains "(1) the background information about the proposed rule, (2) an address for submitting comments, (3) the date by which comments should be received in order to ensure [NRC] consideration . . . . (4) an explanation indicating why the rule change is thought to be needed, and (5) the proposed text to be changed."[202] Interested members of the public can comment on the NRC's proposed rules pursuant to their instructions in the Federal Register, and usually may

---

[197] *Id.*

[198] Pacific Gas & Electric Co. v. State Energy Research Conservation, 461 U.S. 190, 212–13 (1983) (quoting Rice v. Santa Fe Elevator Corp., 331 U.S. 218, 236).

[199] *Id.* at 213 (emphasis omitted).

[200] *See* Kenneth J. Rumelt, *Power Grab: Preempting States' Rights to Turn off Nuclear Power*, 27 NAT'L RES. & ENV'T 24 (2012).

[201] *See The Rulemaking Process*, U.S. NUCLEAR REG. COMM'N, http://www.nrc.gov/about-nrc/regulatory/rulemaking/rulemaking-process.html (last visited Dec. 24, 2016).

[202] *Id.*

submit comments online.[203] Although individual persons may not be as concerned with overall rules that affect the nuclear industry as a whole, they certainly will be interested in any nuclear facility activities where they live. Thus, when a nuclear facility is trying to apply for a new license (e.g. a stand-alone ISFSI license under 10 C.F.R. § 72)[204] or the facility is applying for a license modification, people that live near the facility take keen interest in what the licensee is attempting to do because as local residents of the area surrounding the plant, they have a concrete stake in wanting a satisfactory cleanup of the land and safe decommissioning of the plant.

Besides petitioning the NRC, the general public can influence the regulator and the licensee in other ways. Activist groups have long sued licensee utilities in federal court to enjoin nuclear power operations or at least hinder relicensing projects. For example, in 2010 a group called "Mothers For Peace" sued the NRC in an attempt to make the NRC include an Environmental Impact Statement (EIS) regarding terrorist attacks as one of its requirements for a licensee to construct an ISFSI.[205] The Ninth Circuit denied the petition, stating that the NRC had reasonably considered the National Environmental Policy Act (NEPA), and that an EIS or any hearing with public involvement would likely disclose Safeguards Information, and on balance, national security outweighed any potential disclosure from the EIS process.[206] Another way to influence the licensee specifically is direct protest of a nuclear site. The Shoreham Nuclear Plant (Shoreham) on Long Island, New York is a prime example. On June 3, 1979, 600 protestors and 15,000 demonstrators protested the opening of the Shoreham.[207] Such an outing was spurred by the

---

[203] *See* www.regulations.gov. According to the NRC's webpage there is usually 75–90 days for the public to comment on a particular proposed rule. *Supra* note 201.

[204] New license application processes include formal meetings with the public. *See* 10 C.F.R. § 72 (2015).

[205] San Luis Obispo Mothers for Peace v. NRC, 635 F.3d 1109 (9th Cir. 2011).

[206] *Id.* at 2546.

[207] John McQuiston, *Shoreham Action is One of Largest Held Worldwide*, NEW YORK TIMES, June 4, 1979*; see also* Dan Fagan, *Lights Out at Shoreham*, NEWSDAY,

Three Mile Island incident in Harrisburg, Pennsylvania in March of that same year.[208] As Shoreham faced increased scrutiny and outcry by the public, the town council voted 15-1 that the county's residents could not safely evacuate should the new nuclear plant experience an emergency.[209] Without ever supplying even one kilowatt of power to the commercial grid, Shoreham was permanently shut down—though most of the cost of decommissioning the plant was passed on to the area ratepayers.[210]

I. Decommissioning Costs: Who Pays?

Obviously, decommissioning a nuclear power plant is a safety-challenging endeavor, but who bears the cost of decommissioning? If one were to open his or her electric bill, her or she might see a decommissioning trust fund charge under the "taxes and fees" portion. [211] The electric ratepayers who are receiving the benefit of nuclear power are usually assessed the charge to decommission the plant, when that time comes.[212] These funds are not property of the licensee, and if the licensee goes bankrupt, the funds "cannot be used to satisfy creditors' claims."[213] Under 10 C.F.R. § 50.75(c), every two years the licensee must report "the status of its decommissioning funding for each reactor . . . that it owns" to the NRC.[214] The NRC estimates that decommissioning costs range from $300 to $400 million dollars, though there are various factors that will affect decommissioning, as all plants have unique challenges.[215] For

---

http://web.archive.org/web/20071201005429/http://www.newsday.com/community/guide/lihistory/ny-history-hs9shore,0,563942.story (last visited Dec. 24, 2016).

[208] *See* McQuiston, *supra* note 207.

[209] *See* Fagan, *supra* note 207.

[210] *Id.*

[211] *The Facts About Nuclear Decommissioning Trust Funds: No Reason to Change the Tax Rate on Earnings*, NUCLEAR ENERGY INST. (Mar. 2015), http://www.nei.org/Master-Document-Folder/Backgrounders/Fact-Sheets/The-Facts-About-Nuclear-Decommissioning-Trust-Fund (last visited Jan. 11, 2017).

[212] *Id.*

[213] *Id.*

[214] *Backgrounder on Decommissioning Nuclear Plants*, *supra* note 62.

[215] *Id.*

instance, the decommissioning at Zion Station in Illinois is estimated to cost $1 billion over ten years alone.[216]

In response to the public's worry that these utility licensees will go bankrupt and leave a legacy of nuclear waste behind in the public's backyard,[217] the NRC issued NUREG-1577 to issue guidance for its licensees to assure that licensees will establish proper programs and set aside the necessary monies to decommission the plant in the future.[218] The NRC uses a certain formula specific to the licensee's site to come up with a minimum figure that the licensee must have in its decommissioning trust fund.[219] From time to time, the NRC releases the status of licensee's decommissioning trust fund to the public to enhance public transparency and calm the public's worries.[220]

However, the NRC has been critiqued on the regulation of licensee's decommissioning trusts. In April 2012, the Government Accountability Office (GAO) released a report finding that the NRC's oversight of nuclear power reactors decommissioning funds could be strengthened.[221] The report stated that "NRC's formula may

---

[216] Lisa Song, *Decommissioning a Nuclear Plant Can Cost $1 Billion and Take Decades*, INSIDE CLIMATE NEWS (June 13 2011), http://insideclimatenews.org/news/20110613/decommissioning-nuclear-plant-can-cost-1-billion-and-take-decades (last visited Jan. 11, 2017).

[217] In 2009 the NRC issued a "For the Record" press release to the public, likely to calm the public's nerves in the wake of the "great recession." *For The Record Decommissioning Funding Assurance*, U.S. NUCLEAR REG.COMM'N (June 18, 2009), http://www.nrc.gov/reading-rm/doc-collections/for-the-record/2009/decomm-06-18-09.pdf.

[218] *See Standard Review Plan on Power Reactor Licensee Financial Qualifications and Decommissioning Funding Assurance*, U.S. NUCLEAR REG. COMM'N (Feb. 1999), http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1577/r1/sr1577r1.pdf.

[219] The formula can be found at 10 C.F.R. § 50.75(c) (2011) and 10 C.F.R. § 50.75(c)(2) (2011).

[220] *See*, *e.g.*, Letter from Eric J. Leeds, Director, Office of Nuclear Reactor Reg., to The Commissioners, U.S. NUCLEAR REG. COMM'N (Oct. 2, 2013), http://www.nrc.gov/reading-rm/doc-collections/commission/secys/2013/2013-0105scy.pdf.

[221] *NRC's Oversight of Nuclear Power Reactors' Decommissioning Funds Could Be Strengthened*, U.S. GOV'T ACCOUNTABILITY OFF. (Apr. 2012), http://www.gao.gov/assets/590/589923.pdf.

not reliably estimate adequate decommissioning costs."[222] "According to the NRC, the formula was intended to estimate the 'bulk' of the decommissioning funds needed, but the term 'bulk' is undefined, making it unclear how NRC can determine if the formula is performing as intended."[223] The GAO found that in a comparison with twelve reactor formula estimates, five of the reactors' estimates only captured 57–76% of the costs reflected in the licensee's own self cost estimate.[224] The other seven reactors in the sample were found more accurate by the NRC's formula, capturing 84–103 % of site specific funding estimated.[225] Additionally, the GAO found that the NRC lacked written procedures "describing the steps that staff should take for conducting [balance reviews] which likely contributed to NRC staff not always documenting the results of the reviews clearly or consistently."[226] Finally, the GAO criticized the NRC for not scrutinizing the specific funds that the decommissioning trust funds were invested in.[227] The fear was that if the funds were invested in risky investments, or those funds closely associated with the nuclear industry itself, the funds may not be diversified enough and may be susceptible to considerable loss, which in turn would substantially affect the utility-licensee's ability to decommission the plant in a timely manner.[228]

Additionally, states may have their own way of dispersing decommissioning funds to the utility when the time comes to decommission the plant. For example, in California, the California Public Utility Commission (CPUC) is the "gatekeeper" of the decommissioning trust funds.[229] In order for the licensees to use the money to pay its costs to its contractors and employees who are decommissioning the plant, the licensee must plan out its decommissioning and submit proposed costs to the CPUC every

---

[222] *Id.*

[223] *Id.*

[224] *Id.*

[225] *Id.*

[226] *Id.*

[227] *NRC's Oversight of Nuclear Power Reactors' Decommissioning Funds Could Be Strengthened, supra* note 221.

[228] *Id.*

[229] *California Nuclear Decommissioning*, CA.GOV, http://www.dra.ca.gov/general.aspx?id=2489 (last visited Jan. 11, 2017).

three years (the Triennial Review of Nuclear Decommissioning Trusts).[230] During the proceedings, nuclear licensees in California submit their costs for the construction and maintenance of the ISFSI and for the safe storage of spent nuclear fuel, so it can pay its employees, contractors, and other costs of nuclear fuel storage and plant decommissioning. These costs, once approved by the CPUC, are used to sue the Department of Energy for its partial breach of contract of failure to take and possess the licensee's fuel by 1998 per the National Waste Policy Act.[231]

When a nuclear plant permanently ceases power operations, it is almost inevitable that jobs will be lost due to the fact that a non-power operating plant poses much less of a risk to the public than an operating plant does, in regards to safety and security, and thus less jobs are needed. In turn, local municipalities and counties take a substantial hit when the local nuclear plant stops generating power—their tax bases sometimes can rely dominantly on the operation of a nuclear plant in the municipality or county.

For example, the town of Rowe, Massachusetts for a long time was home to the Yankee Rowe Nuclear Plant.[232] When Yankee Rowe permanently shut down, many jobs were eliminated, and in 1994, 46% of the workforce had left the plant.[233] That same year, Yankee Rowe's parent corporation, Yankee Atomic Energy Company (Yankee Atomic), paid "about $200,000 in property taxes, which approximated 28 percent of what it had paid in 1991 . . . ."[234] However, the story was not entirely bleak news. Decommissioning continued to provide jobs to the community of Rowe, approximately 300 contractors and/or Yankee Atomic employees.[235] Since these jobs were still in place for the moment, the economic decline would be gradual and most of the employees dismantling the plant would remain and spend their money locally.[236] Therefore, the economic

---

[230] *Id.*

[231] *See supra* Part D and accompanying notes.

[232] *See* John Mullin & Zenia Kotval, T*he Closing of the Yankee Rowe Nuclear Power Plant: The Impact on a New England Community*, LANDSCAPE ARCHITECTURE & REG'L PLANNING FACULTY PUBL'N SERIES, Paper 25 (1997).

[233] *Id.*

[234] *Id.*

[235] *Id.*

[236] *Id.*

impact of a permanently shut nuclear plant is not a "hard thud" of reality but more of a "soft, gradual descent"—thus the "bittersweet" moment we saw earlier in this article when a licensee decides to permanently cease power operations.[237]

IV. SUMMARY AND RECOMMENDATIONS

Decommissioning a nuclear power plant can be a long, costly, and complex process. As stated previously, licensees are faced daily with a litany of regulations from federal, state, and local authorities.[238] NRC regulations are the main focus of a decommissioning power reactor, though it must additionally answer to state, county and city regulators where it operates. Additionally, there is the public image factor—the licensees, often electric utilities, want to maintain a positive corporate image. Utilities usually want to maintain a favorable public opinion—thus, to being a "good neighbor" by being good "stewards" of the environment and local community through the decommissioning processes will help achieve that goal. Some utilities establish Community Action Boards (CABs) with local stakeholders to ensure that updates in the decommissioning process get disseminated to the interested public, and to solicit the public's input on what ongoing concerns it has about the decommissioning project.[239]

Decommissioning is especially risky when a utility's brand is at stake and the utility itself has decided to lead the decommissioning

---

[237] *See supra* note 1.

[238] *See supra* Part H and accompanying notes.

[239] For example, at PG&E's HBPP facility in Eureka, California, a CAB met monthly at the site, and CAB members included some anti-nuclear groups and the office of the local congressman. Issues the CAB brought forth included disposal of embedded beams in the nuclear plant's foundation as well as the increased truck traffic along their local roads, which caused potholes and excessive noise in their neighborhoods. With the CAB's input, these problems were solved for a mutual benefit between the public and the licensee. *See Learn about the History of the Humboldt Bay Power Plant*, PACIFIC GAS & ELECTRIC CO., https://www.pge.com/en_US/about-pge/environment/what-we-are-doing/buildings-and-operations/humboldt-bay-power-plant.page?WT.mc_id=Vanity_humboldtbay (last visited Jan. 11, 2017).

process, instead of a contractor.[240] A utility must use the utmost care in decommissioning the plant and hiring its subcontractors with proven track records to avoid any safety violations, which in turn could result in unwanted fines from the NRC and unwanted press.

The decommissioning of a nuclear power plant is akin to a moving target because of the constant state of change at the site. To this point, the NRC has not specifically tailored any regulation to the decommissioning process—if a plant fell subject to 10 C.F.R. § 50, the plant, even while decommissioning, must comply with rules promulgated unless the NRC specifically stated in its rule that decommissioning power reactors were not subject to the new rule, or regulation. Thus, a lot of time under decommissioning the nuclear plant process is devoted to submitting License Amendment Requests (LAR) and exemption requests to the NRC for regulations that simply do not, or cannot, apply to them. This in turn causes the NRC undue hardship in reviewing the LAR and further creates a backlog in its work. The NRC should come up with a new set of regulations specific to decommissioning power reactors that simply make sense to the decommissioning plant instead of the current program—power-generating nuclear plant regulations that are inappropriately applied to permanently shut down nuclear plants being dismantled. However, it seems that the NRC is taking steps in the right direction. In late 2015, the NRC released a proposed draft rule (request for comment) to its stakeholders in regards to proposed changes and regulatory improvements for power reactors.[241] Although this rule

---

[240] Compare to Zion Station, where Exelon transferred the "possess but not operate" license to EnergySolutions, of Clive Utah, for the sole purpose of decommissioning (establishing a company called ZionSolutions). This way, ZionSolutions will bear all liability to the plant but be able to turn a profit on the decommissioning endeavor. Upon completion of the project, ZionSolutions will transfer the license back to Exelon at the end of decommissioning. *See Decommissioning And Site Restoration of the Zion Station,* ZIONSOLUTIONS LLC, http://www.zionsolutionscompany.com/project/decommissioning (last visited Dec. 25, 2016).

[241] Regulatory Improvements for Decommissioning Power Reactors, 80 Fed. Reg. 72358-01 (Nov. 19, 2015) (to be codified at 10 C.F.R., pt. 26, 50, 52, 73, and 140). In June 2016, Pacific Gas & Electric, due to the strong urging of environmental groups and economic factors, chose to permanently shut down California's last operating nuclear plant by August 2025. *See* Ivan Penn & Samantha Masunaga, *PG&E to Close Diablo Canyon, California's Last Nuclear*

will no doubt take a few years to be promulgated, it is a step in the right direction for both the NRC and the licensees to have a more common sense, simplified regulatory structure that encourages compliance and safety at nuclear sites across the United States.[242]

At present in the U.S., spent nuclear fuel and Greater Than Class C waste is stored at sites across the country.[243] Some of these sites are on an ocean coastline and remain in highly seismic areas.[244] This consequently makes the American public, and some U.S. Senators, uneasy.[245] First, in the midst of the Fukushima Daiichi incident of 2013, the public has good reason to be concerned about the storage of spent nuclear fuel amongst coastline communities in the United States.[246] Although spent nuclear fuel is authorized to be stored long-term in Spent Fuel Pools (SFP), it is concerning for a utility to employ this method whose facility is in a seismically active area along a coastline. A leak or crack in the SFP from a seismic event could possibly drain the pool of the demineralized water, which

---

Plant, L.A. TIMES (June 21, 2016), http://www.latimes.com/business/la-fi-diablo-canyon-nuclear-20160621-snap-story.html (last visited Jan. 11, 2017).

[242] Moreover, nuclear decommissioning and nuclear fuel storage issues seem to have caught the House of Representative's attention. On April 20, 2016, Rep. Peter Welch of Vermont introduced the Nuclear Plant Decommissioning Act of 2016. This Act, if passed, would require the NRC to consult and involve state and local governments when a licensee drafts a PSDAR. *See* H.R. 4998, 114th Cong. (2016). Rep. Robert Dold of Illinois introduced a bill entitled the Stranded Nuclear Waste Act of 2016. This bill would create a seven-year program where the DOE would compensate those communities affected by the DOE's failure to take the nuclear waste, at a rate of $15 per kilogram of Spent Nuclear Fuel stored at the former power plant location. *See* H.R. 5632, 114th Cong. (2016).

[243] *See supra* Part H (illustrating the DOE's failure to take the fuel by 1998 per the NWPA).

[244] Two examples are SONGS in San Onofre, California and Diablo Canyon Power Plant in Avila Beach, California.

[245] *See* PLATTS, *U.S. Senate Members Introduce Three Bills on Nuclear Plant Decommissioning, Spent Fuel* (Apr. 15, 2015), http://www.platts.com/latest-news/electric-power/washington/us-senate-members-introduce-three-bills-on-nuclear-21299304 (last visited Jan. 11, 2017).

[246] After a 9.0 earthquake near Japan, the Fukushima Daiichi unit safely shut down as designed, however the resulting tsunami knocked power offline, which was needed to cool the fuel. Without cooling, the pool water heated up and the fuel became damaged. For more information, see *Fukushima Accident*, WORLD NUCLEAR ASSOCIATION (Nov. 2016), http://www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/fukushima-accident.aspx.

would remove the radiation shield and coolant for the fuel.[247] The NRC should promulgate regulations to all nuclear power facilities to construct dry cask storage facilities (ISFSIs), at least for those facilities that reside in seismically active regions. Moreover, the NRC should additionally encourage subterranean dry cask storage facilities like Callaway and Humboldt Bay's ISFSI, for the added security protections that this design affords.[248]

Regarding decommissioning power plant and ISFSI security, the NRC needs to clarify and codify its rules and not issue long-term regulation by orders via "Interim Compensatory Measures," or ICMs. The Security ICMs have certainly added value to the nation's nuclear security, but have been issued now for over fourteen years and are anything but "interim." Simply codifying these ICMs as regulation would be the best way to obtain compliance from licensees and furthermore add an additional *permanent* layer of safety and security to decommissioning nuclear plant and ISFSI security forces. Moreover, the NRC should not mandate decommissioning and ISFSI security personnel to conduct Force-on-Force drills. If mandated, it would add too much of a cost burden regarding staffing and security enhancements of ISFSI and decommissioning licensees, who already are not generating any income because the licensee's nuclear unit has permanently ceased power operations. Furthermore, once a nuclear power plant has permanently ceased power operations, the risk to the public is substantially decreased.

Currently, personnel at ISFSIs are not required by the NRC to be randomly drug tested or screened for alcohol if the employee is called out on short notice, nor in the course of regular employment. This makes no sense—ISFSI personnel guard and operate critical infrastructure, and are counted on as part of promoting the common defense for the country. For ISFSI personnel, the NRC should institute the 10 C.F.R. § 26 Fitness for Duty requirements so that the NRC and the American public can have added confidence in the security of this critical infrastructure.

---

[247] *See supra* note 8.

[248] *See Civil Construction of the Underground Storage Facility (HI-STORM UMAX) at Callaway is Underway*, HOLTEC INTERNATIONAL (May 30, 2014), http://www.holtecinternational.com/2014/05/civil-construction-of-the-underground-storage-facility-hi-storm-umax-at-callaway-is-underway/ (last visited Jan. 11, 2017).

Finally, the NRC should embrace the General Accounting Office's recommendations of 2012 in more federal oversight of decommissioning trusts. The risk of mismanagement of these funds can be great, and more needs to be done to ensure that these funds will be fully funded to pay the ever-increasing costs of plant decommissionings in the future. It is not fair to ask today's public—who did not receive any benefit from an operating plant before their time—to pay for the nuclear plant's clean up due to low estimates of the decommissioning costs. The NRC, along with state public utility commissions, should promulgate rules that state that if a licensee negligently underestimates costs, or egregiously depletes its Decommissioning Trust Fund, the licensee itself will solely bear the costs and cannot pass these costs on to the ratepayers. This way, it can be assured that all nuclear plants will relatively return to the state they once were: an open field where the land can someday again be utilized for some other useful activity.