PRM-50-114
PETITION

Union of Concerned Scientists
ucsusa.org Two Brattle Square, Cambridge, MA 02138-3780 t 617.547.5552 f 617.864.9405
1825 K Street NW, Suite 800, Washington, DC 20006-1232 t 202.223.6133 f 202.223.6162
2397 Shattuck Avenue, Suite 203, Berkeley, CA 94704-1567 t 510.843.1872 f 510.843.3785
One North LaSalle Street, Suite 1904, Chicago, IL 60602-4064 t 312.578.1750 f 312.578.1751

September 1, 2016

Annette Vietti-Cook, Secretary
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Rulemaking and Adjudications Staff

Submitted electronically to Rulemaking.Comments@nrc.gov

Dear Ms. Vietti-Cook:

On behalf of the Union of Concerned Scientists (UCS) and the co-petitioners listed below, I respectfully submit the enclosed petition for rulemaking pursuant to §2.802 in Title 10 of the Code of Federal Regulations (10 CFR). Basically, the petition seeks to have the U.S. Nuclear Regulatory Commission (NRC) promulgate regulations applicable to nuclear power reactors with operating licenses issued by the NRC but in an extended outage.

Co-Petitioners:

Jim Riccio
Nuclear Policy Analyst
Greenpeace
702 H street NW #300
Washington, DC 20001

Geoffrey H. Fettus
Senior Attorney
Natural Resources Defense Council
1152 15th Street NW, Suite 300
Washington, DC 20005
www.NRDC.org

The petitioners request a public meeting with the NRC after our petition has been accepted by the staff but before the agency publishes a notice in the *Federal Register* seeking comments on the petition. The purpose of this public meeting would be to reach a common understanding regarding the problems that we feel need to be resolved by the requested rulemaking. We would not expect the NRC staff to agree or disagree with us about these problems or the efficacy of the proposed rulemaking solution. Rather, the meeting would serve the same role as the public meeting opportunity provided in Management Directive 8.11 for persons submitting petitions under §2.206 in 10 CFR to meet with the Petition Review Board.

Sincerely,

David A. Lochbaum
Director, Nuclear Safety Project

Union of Concerned Scientists
PO Box 15316
Chattanooga, TN 37415
423-468-9272, office
dlochbaum@ucsusa.org

Enclosure: Petition for Rulemaking—Power Reactors in Extended Shutdowns

Petition for Rulemaking—Power Reactors in Extended Shutdowns

Background
By letter dated August 4, 2016 (ADAMS ML16218A266), Mr. John B. Giessner of the NRC staff responded to questions posed by Mr. David A. Kraft of the Nuclear Energy Information Service (NEIS) about permanent closure of nuclear power reactors and their subsequent decommissioning. As part of the response to Question 1(b), Mr. Giessner wrote "*there is no regulation that would prevent the licensee from changing its decision to cease operations by retracting its certification to permanently cease operation*." As part of the response to Question 2, Mr. Giessner wrote "*the NRC's regulations do not prohibit a licensee from voluntarily placing its facilities in an extended shutdown while continuing to meet all safety and security requirements as outlined in the facility's operating license*."

A nuclear power reactor in an extended shutdown is not overly speculative or hypothetical—the Tennessee Valley Authority (TVA) voluntarily shut down the Unit 1 reactor at its Browns Ferry Nuclear Plant (Alabama) in March 1985 and kept it shut down until June 2007. Today, with nuclear power plants facing economic competition from non-nuclear electricity supplies, an owner might decide to shut down reactors until the marketplace becomes more favorable or the decision to proceed with decommissioning is made.

The Browns Ferry case raised questions that remain unanswered. For example, TVA paid the multi-million fee collected annually by the NRC since the early 1990s for its regulatory oversight functions. While the NRC's oversight of Unit 1 was significantly curtailed during the extended shutdown, the NRC continued to have multiple resident inspectors assigned to Browns Ferry and staff from regional and headquarters offices visited Browns Ferry for oversight of the operating Unit 2 and 3 reactors. But what if the reactor in an extended outage was at a single-unit site? Or, what if all reactors at a multiple-unit site were voluntarily placed into extended outages? Would the owner still want to pay millions of dollars in licensing fees each year? Would the NRC still maintain a regulatory presence at a non-operating plant site?

The extended shutdown scenario affects more than licensee fees. Many issues being addressed by the NRC's ongoing decommissioning rulemaking would also apply to reactors during extended shutdowns:

- Are the biennial emergency exercises under 10 CFR 50.47 still required at a site with no operating reactors but whose reactors have not yet formally and officially entered the decommissioning phase? If not, what assures adequate proficiency of offsite responders before the reactor resumes operating?

- Because a reactor in extended shutdown may enter decommissioning rather than restarting,[1] should the decommissioning fund amounts required by 10 CFR 50.75(c) be re-assessed?

- What is the Design Basis Threat and associated security requirements for a site with only reactors in extended shutdowns?

The existing regulations are not clear on these points because they were promulgated for operating reactors and for reactors undergoing decommissioning—not for reactors in limbo that will at some unspecified later date return to the operating reactor world or join the decommissioning community.

The reactor in extended shutdown scenario entails issues beyond those being addressed by the NRC's decommissioning rulemaking. For example:

[1] For example, Crystal River 3 and San Onofre Units 2 and 3 did not emerge from their year-plus extended outages.

- 10 CFR 50.55a requires periodic inspections of reactor pressure vessels and certain piping per industry codes and standards. These codes and standards do not incorporate lengthy "time-out" provisions allowing exams required to be undertaken periodically to be suspended or deferred. Can these inspections be suspended? If so, do the suspensions require prior NRC approval?

- Do the individuals issued senior reactor operator and reactor operator licenses by the NRC under 10 CFR 55 lose those licenses after many months of idleness or can they retain their proficiencies and licenses by following certain protocols?

- The NRC has renewed the operating licenses for many reactors following review and acceptance of aging management programs for passive structures and components.

    - Does a reactor in an extended shutdown still have to perform the measures specified in the NRC-reviewed aging management program for passive structures and components?

    - Active components were excluded from the scope of aging management programs under the license renewal rule because reactor operation coupled with routine surveillance testing and inspection measures protected against aging degradation compromising safety margins. Does the passivity of formerly active components during extended shutdowns require an NRC-reviewed supplement to its aging management program to establish the appropriate measures for the deactivated structures and components?

The NRC has regulations intended to ensure that the risk from operating reactors is at an acceptably low level.

The NRC has regulations intended to ensure that the risk from a permanently shut down reactor is at an acceptably low level until license termination.

The NRC lacks regulations to manage the risk from reactors in extended shutdowns that may someday seek to restart. This petition for rulemaking seeks to fill that void.

Proposed Rule on Reactor Extended Shutdowns

The petitioners request that the NRC issue a final rule that defines a reactor extended shutdown condition, establishes the requirements applicable during a reactor extended shutdown, and establishes the requirements that must be satisfied for a reactor to restart from an extended shutdown.

The final rule should explicitly state that a licensee providing the NRC with written certification under 10 CFR 50.82(a)(1)(i) of permanent cessation of reactor operations cannot retract that certification and opt to place the reactor into an extended shutdown en route to resumption of reactor operations.

Reactor Extended Shutdown Definition

Either of two criteria should place a reactor into an extended shutdown. First, the licensee should be able to notify the NRC of its intention to put a reactor into an extended shutdown similar to how licensees notify the NRC under 10 CFR 50.82(a)(1)(i) and 10 CFR 50.4(b)(8) of intentions to permanently cease reactor operations. Second, a reactor being shut down for two years that is not actively pursuing restart under a formal NRC process like Manual Chapter 0350[2] should also invoke the regulatory requirements developed by this rulemaking governing reactor extended shutdowns.

Reactor Extended Shutdown Activities Report

Prior to entry into a Reactor Extended Shutdown, a licensee should be required by the final rule to submit a Reactor Extended Shutdown Activities Report (RESAR), similar to the requirement in 10 CFR 50.82(a)(4)(i) for the Post-Shutdown Decommissioning Activities Report (PSDAR). As a minimum, the RESAR should describe how the following activities will be handled during the extended shutdown:

1. Describe whether licenses issued by the NRC to individuals under 10 CFR 55 will be terminated or what training and requalification programs will be used to continue the licenses.
2. Describe how existing aging management program measures will be sustained, reduced, or expanded during the extended shutdown period.
3. Explain whether testing and inspections per the technical specifications and in-service inspection requirements will be continued as-is or justify lay-up programs that will guard against undue degradation during the extended shutdown period.
4. Describe how the aging management program will be supplemented to cover active components no longer being checked by reactor operation and routine surveillance testing.
5. Describe how measures implemented to comply with the quality assurance requirements of 10 CFR 50 Appendix B during reactor operation will be applied during the period of reactor extended shutdown.
6. Describe the commitments to be in place during the extended shutdown period to minimize the chances that irradiated fuel becomes damaged and to protect workers and the public should irradiated fuel become damaged (e.g., through a loss of the integrity of containment barriers or the inoperability of filtered ventilation systems).
7. Describe how measures implemented to comply with the fitness for duty requirements of 10 CFR Part 26 will be applied during the period of reactor extended shutdown.

If the final rule does not generically address topics like emergency planning exercises, Design Basis Threats and associated physical protection measures, and handling operating experience (i.e., NRC bulletins and generic letters as well as vendor advisories and manual updates), the RESAR should describe how these topics will be handled.

[2] NRC Inspection Manual Chapter 0350, "Oversight of Operating Reactor Facilities in a Shutdown Condition with Performance Problems."

Requirements for Exiting a Reactor Extended Shutdown

The owner of a reactor in an extended shutdown may decide to restart that reactor or to enter decommissioning. The final rule should ensure a smooth transition along either pathway.

For the restart pathway, the final rule must establish how deferred and suspended activities are resumed. For example, if biennial emergency exercises under 10 CFR 50.47 were suspended, is a FEMA/NRC graded exercise required before operation resumes? Basically, for each activity deferred, suspended, or reduced during the period of reactor extended shutdown, the final rule and its associated regulatory guidance must clearly establish how these activities are resumed or reinstated.

The final rule must also clearly establish when and to what extent a power ascension startup program is required for reactor re-operation. The Browns Ferry Unit 1 reactor was restarted after being in an extended shutdown between March 1985 and June 2007. This restart benefitted from the Unit 2 and 3 reactors operating at the site for more than the prior decade. Workers at the site had recent experience to apply to Unit 1. The Unit 2 and 3 operations provide confidence in the procedures to be used in the operations, testing, and maintenance of Unit 1. But what if Browns Ferry Unit 1 had not had operating reactors nearby? A power ascension startup program would have verified that the infrastructure necessary to support safe reactor operation was adequately in place.

Decommissioning Activities During Reactor Extended Shutdowns

A reactor in an extended shutdown may eventually resume operation or it may enter into decommissioning instead. Owners are likely to spend money during an extended shutdown to preserve both options. In fact, it is absolutely certain that decommissioning will happen after a reactor extended shutdown; the only uncertainty is whether another period of reactor operation will be sandwiched in between. The final rule must clearly address whether decommissioning funds may be used for activities during a reactor extended shutdown and, if so, the criteria and conditions governing use of decommissioning funds.

NRC regulations 10 CFR 50.75(f)(1) and (f)(2) require owners to report at least once every two years on the status of its decommissioning funding and related factors. In addition to these requirements for biennial reports, 10 CFR 50.75(f)(3) states that: *Each power reactor licensee shall at or about 5 years prior to the projected end of operations submit a preliminary decommissioning cost estimate which includes an up-to-date assessment of the major factors that could affect the cost to decommission.*

The final rule must require licensees to submit a preliminary decommissioning cost estimate to the NRC at five-year intervals throughout the period of reactor extended shutdown.

Need for Proposed Rule

The problem this rulemaking seeks to solve is that the NRC's regulations were developed for operating reactors and decommissioning reactors and do not adequately cover reactors in between these two states. Not only are the existing regulatory requirements governing operating reactors not sufficiently applicable to reactors in extended shutdowns, but new regulatory requirements for operating reactors could emerge and it is uncertain how these would apply to reactors in extended shutdowns.

Moreover, operating licenses and any amendments are issued after public licensing processes. But currently, a licensee can elect to place a licensed reactor into an extended shutdown for literally decades and virtually make up its own rules for what it does, how it does it, and when it does it without any NRC review and approval or public participation. This petition for rulemaking seeks to remedy that problem.

Existing Regulatory Requirements During a Reactor Extended Shutdown

10 CFR 50.34 establishes the requirements for and contents of the safety analysis report to be submitted to the NRC with an application for a reactor operating license. 10 CFR 50.36 establishes the requirements for and content of technical specifications also to be submitted to the NRC with an application for a reactor operating license. The safety analysis report and technical specifications, once NRC has issued an operating license, constitute regulatory requirements intended to manage the risk from nuclear power reactor operation. 10 CFR 50.71(e) requires licensees to periodically update the safety analysis report "to assure that the information included in the report contains the latest information developed" and to submit these updates to the NRC. Similarly, 10 CFR 50.90 requires licensees to submit amendment requests to the NRC for proposed changes to the technical specifications. In summary, the safety analysis report and technical specifications are living documents intended to establish and then sustain the appropriate and applicable regulatory requirements that help provide reasonable assurance of adequate protection of public health and safety during reactor operation.

The last three words are key. These existing regulatory requirements were developed with reactor operation in mind. The NRC's Standard Technical Specifications specify five modes of reactor operation: (1) power operation; (2) start-up; (3) hot shutdown; (4) cold shutdown; and (5) refueling. (See Table 1.) The NRC's Standard Technical Specifications for the other operating reactor types are essentially identical on this point. The mode of a reactor will determine the requirements for the minimum complement of safety-related systems, structures and components needed for reactor operation. The mode also establishes the associated surveillance requirements intended to provide assurance that the safety functions will be performed.

The condition when the entire inventory of irradiated fuel has been offloaded from the reactor vessel into the spent fuel pool is often termed Mode 6, or the defueled condition. Unless explicitly stated for individual technical specifications, none of the regulatory requirements for Modes 1-5 are applicable during the defueled condition. A reactor in an extended shutdown is very likely to be in the defueled condition—where the fewest technical specification requirements apply.

For example, the secondary containments enclosing spent fuel pools for boiling water reactors would not be required to be operable throughout the majority of an extended shutdown. The NRC requires secondary containment to be operable only in Modes 1-3, during movement of irradiated fuel inside secondary containment and during activities with the potential for draining the reactor vessel. (See Figure 1.) But the irradiated fuel in spent fuel pools could be damaged and release radiation if the pool's cooling system was lost or the water drained from the pool.

The safety analysis reports would not backstop the technical specifications. Section 15.0 (ADAMS ML070710376) of the NRC's Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants describes the studies of postulated accidents and transients required for U.S. nuclear power reactors. No accident or transient involving the spent fuel pool must be considered other than a fuel handling accident (one in which irradiated fuel is dropped while being moved or banged into a wall or rack to damage fuel rods). This potential accident is why secondary containment is required during irradiated fuel movements—to mitigate such accidents. But the safety analysis reports do not evaluate damage to irradiated fuel in spent fuel pools caused by loss of the cooling system or drainage of water from spent fuel pools. If they did, than the exception requiring secondary containment to be operable when activities that may drain the reactor vessel would be expanded to at least include activities that may drain the spent fuel pool.

Workers at a reactor in the defueled condition during an extended outage could legally remove the walls and ceiling of the secondary containment; replicating the remodeling that hydrogen detonations achieved at the BWR/4 reactors known at Fukushima Daiichi Units 1, 3, and 4. The existing regulatory requirements are insufficient to ensure protective measures, such as the secondary containments enclosing spent fuel pools, are sustained during extended shutdowns to retain the reasonable assurance of adequate protection standard.

Further evidence that existing regulatory requirements are insufficient during reactor extended shutdowns is in 10 CFR 50.82(a)(4)(i), which requires licensees to submit a Post-Shutdown Decommissioning Activities Report (PSDAR) within two years after permanent cessation of operation. 10 CFR 50.82(a)(4)(ii) requires the NRC to make the PSDAR available for public comment.

If the existing regulatory requirements adequately bound conditions throughout decommissioning to license termination, the PSDAR would not have to be submitted within two years. Additionally, that the NRC must issue the PSDAR for public comment implies the public might not be satisfied by the PSDAR and seek legal remedies for its dissatisfaction.

Emerging Regulatory Requirements During Reactor Extended Shutdown

By letter dated August 4, 2016 (ADAMS ML16218A266), the NRC staff responded to questions posed by NEIS about permanent closure of nuclear power reactors and their subsequent decommissioning. As part of the response to Question 2, the NRC wrote "*the NRC's regulations do not prohibit a licensee from voluntarily placing its facilities in an extended shutdown while continuing to meet all safety and security requirements as outlined in the facility's operating license*."

TVA placed the Unit 1 reactor at its Browns Ferry Nuclear Plant in an extended shutdown between March 1985 and June 2007. Contrary to the NRC's assertion, TVA did not continue to meet all safety and security requirements for Unit 1. Instead, TVA met only those requirements it, not the NRC, deemed applicable to a reactor during what it termed "administrative hold."

The current licensing basis as defined in 10 CFR 54.3 is:

> *Current licensing basis* (CLB) is the set of NRC requirements applicable to a specific plant and a licensee's written commitments for ensuring compliance with and operation within applicable NRC requirements and the plant-specific design basis (including all modifications and additions to such commitments over the life of the license) that are docketed and in effect. The CLB includes the NRC regulations contained in 10 CFR parts 2, 19, 20, 21, 26, 30, 40, 50, 51, 52, 54, 55, 70, 72, 73, 100 and appendices thereto; orders; license conditions; exemptions; and technical specifications. It also includes the plant-specific design-basis information defined in 10 CFR 50.2 as documented in the most recent final safety analysis report (FSAR) as required by 10 CFR

> 50.71 **and the licensee's commitments remaining in effect that were made in docketed licensing correspondence such as licensee responses to NRC bulletins, generic letters, and enforcement actions** [emphasis added], as well as licensee commitments documented in NRC safety evaluations or licensee event reports.

As documented in UCS's April 5, 1988, petition pursuant to 10 CFR 2.206, the NRC issued 39 bulletins, 141 generic letters, and 1,047 information notices between the time when TVA placed Unit 1 on "administrative hold" (June 1, 1985) and March 31, 1998. As reflected in TVA's letter dated October 23, 1997, in response to NRC Generic Letter 96-06, TVA took no actions on Unit 1 in response to NRC bulletins, generic letters and licensing correspondence (unless deferring actions counts as actions).

While it certainly may be permissible to defer action on some NRC bulletins, generic letters, and licensing correspondence, it is unlikely to be permissible in all cases. For example, TVA committed to a comprehensive design basis verification program for Browns Ferry Units 2 and 3 in its response dated October 12, 1997, to the NRC's request under 10 CFR 50.54(f) regarding the adequacy and availability of design basis information, but deferred undertaking that effort for Unit 1. At that time, the Unit 1 reactor was defueled such that design basis questions about emergency core cooling systems might have been moot. But the design basis of the spent fuel pool, its cooling system, and its emergency makeup system were not moot given that the pool contained the entire reactor core's inventory of irradiated fuel plus *all* irradiated fuel produced by Unit 1 since it began operating in 1974.

Plant owners receive considerable operating experience reports from vendors and from the Institute for Nuclear Power Operations. If TVA deferred review and action on NRC bulletins and generic letters, it seems safe to assume that TVA also deferred review and action on non-NRC operating experience reports. For equipment in lay-up, such deferrals likely had negligible consequence at best. But for equipment being used to cool and clean the water in the spent fuel pool and perform other necessary functions, deferring review and action may be imprudent at best, unsafe at worst. The NRC has sanctioned owners of operating reactors for failures to incorporate operating experience (e.g., EA-11-227 at Palisades on January 3, 2012, EA-10-080 at Calvert Cliffs on August 3, 2010). While the operating experience applicability at a reactor in an extended shutdown may be significantly reduced, it cannot reasonably be assumed to become zero. Therefore, it is necessary to at least require a screening process for incoming operating experience reports that parses out those reports potentially applicable to the reactor in that configuration and has them formally reviewed for potential implementation at the site.

The regulations for reactor extended shutdowns, and their associated regulatory guidance, should clearly establish how emerging regulatory requirements, including operating experience reports, are to be handled. A reactor in an extended shutdown should not simply defer all emerging regulatory requirements until a decision to restart the reactor. The process should require licensees to justify to the NRC why some requirements can be deferred and to implement those that cannot be deferred.

Bottom Line on Need for a Proposed Rule on Reactor Extended Shutdowns

No plant owners have yet placed their reactors into extended shutdowns, deferring a decision on whether to restart them or pursue decommissioning. However, it would be prudent for the NRC to conduct this rulemaking now—before a reactor enters an extended shutdown. Otherwise, the agency will be forced to handle fee, emergency planning, and other issues by exemptions—a regulatory mode that should more often disparaged than avoided.

Table 1: Modes of Nuclear Reactor Operation

Table is taken from the NRC's Standard Technical Specifications for General Electric BWR/4 Plants (NUREG-1433, Vol. 1, ADAMS ML12104A192). The NRC's Standard Technical Specifications for the other operating reactor types are essentially identical.

Table 1.1-1 (page 1 of 1)
MODES

MODE	TITLE	REACTOR MODE SWITCH POSITION	AVERAGE REACTOR COOLANT TEMPERATURE (°F)
1	Power Operation	Run	NA
2	Startup	Refuel[(a)] or Startup/Hot Standby	NA
3	Hot Shutdown[(a)]	Shutdown	> [200]
4	Cold Shutdown[(a)]	Shutdown	≤ [200]
5	Refueling[(b)]	Shutdown or Refuel	NA

(a) All reactor vessel head closure bolts fully tensioned.

(b) One or more reactor vessel head closure bolts less than fully tensioned.

Figure 1: Requirement for Secondary Containment In Modes 1,2, and 3

From Section 3.6.4.1 of the NRC's Standard Technical Specifications for General Electric BWR/4 Plant (NUREG-1433, Vol. 1, ADAMS ML12104A192). It is comparable to the NRC's Standard Technical Specifications for the other operating reactor types.

3.6 CONTAINMENT SYSTEMS

3.6.4.1 [Secondary] Containment

LCO 3.6.4.1 The [secondary] containment shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
During movement of [recently] irradiated fuel assemblies in the [secondary] containment,
During operations with a potential for draining the reactor vessel (OPDRVs).

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. [Secondary] containment inoperable in MODE 1, 2, or 3.	A.1	Restore [secondary] containment to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1	----------NOTE---------- LCO 3.0.4.a is not applicable when entering MODE 3. ---------- Be in MODE 3.	12 hours
C. [Secondary] containment inoperable during movement of [recently] irradiated fuel assemblies in the [secondary] containment or during OPDRVs.	C.1	----------NOTE---------- LCO 3.0.3 is not applicable. ---------- Suspend movement of [recently] irradiated fuel assemblies in the [secondary] containment.	Immediately
	AND		
	C.2	Initiate action to suspend OPDRVs.	Immediately