June 3, 2016

The Honorable Barbara Boxer
Ranking Member, Committee on
Environment and Public Works
United States Senate
Washington, DC 20510

Dear Senator Boxer:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am responding to the May 20, 2016, letter from you and your colleagues seeking the following information on degraded baffle-former bolts at U.S. nuclear power plants: identification of plants with a design similar to facilities at Indian Point Energy Center (Indian Point) and Salem Nuclear Generating Station (Salem); factors that can contribute to bolt degradation; and a schedule for inspecting reactors with the potential for such degradation.

Based on our independent assessment of this issue, the NRC does not have an immediate safety concern at this time that would lead us to shut down any U.S. nuclear power plant or prevent the restart of any plant from an outage. Baffle assemblies are constructed with a significant amount of structural margin and integrity of the baffle plates can be maintained even with the failure of a substantial number of bolts. Any damage to fuel created by loose baffle-former bolt parts would be detected by routine monitoring of reactor coolant radioactivity.

Only Westinghouse-designed pressurized-water reactors (PWRs) with four reactor coolant loops have reported significant bolt degradation. Although there are 29 such plants in the United States, the condition appears to be further limited by two factors: the degraded bolts have predominantly been of a certain type of stainless steel, and they have all been in reactors with baffles in a “downflow” configuration, meaning the water entering the reactor is pushed downward between the baffle and the core barrel, which creates more pressure across the plates and stress in the bolts.

There are only seven four-loop Westinghouse reactors at four sites with both the most susceptible bolt material and a downflow configuration: Indian Point Units 2 and 3; Salem Units 1 and 2; D.C. Cook Nuclear Power Plant (D.C. Cook) Units 1 and 2; and Diablo Canyon Nuclear Power Plant (Diablo Canyon) Unit 1. (Diablo Canyon’s Unit 2 has been reconfigured to an upflow baffle).

This type of bolt degradation has been previously observed, although the number of degraded bolts found during the recent inspections at Indian Point Unit 2 and Salem Unit 1 was beyond what the NRC would have expected. Degraded baffle-former bolts were detected in French reactors in the late 1980s and 1990s, and the NRC published an Information Notice in 1998 alerting the U.S. nuclear power industry. That Notice prompted several plants to inspect their bolts, and some made adjustments to their baffles or replaced bolts as a result. Guidance from the Electric Power Research Institute (EPRI), which was evaluated and approved by the NRC, calls for visual and ultrasonic inspections during a certain period in a reactor’s lifespan. The current inspections at Indian Point and Salem were performed as a result of this operational experience.

This experience indicates that bolt degradation generally starts to appear sometime after 25 “effective full-power years” of operation (i.e., actual reactor operation at power, not calendar years). Licensees are required to perform a general visual inspection of their reactor vessel internals every 10 years in accordance with the American Society of Mechanical Engineers’ code. To enhance detection of baffle-former bolt degradation, the EPRI guidance advises PWR operators to perform ultrasonic testing of baffle-former bolts sometime between 25 and 35 effective full-power years. The NRC requires these inspections as part of aging management plans for reactors with renewed licenses.

As a result of the findings at Indian Point Unit 2, the licensee, Entergy Nuclear Operations, decided that it will conduct ultrasonic testing of baffle-former bolts in Indian Point Unit 3 during its next outage in spring 2017. The Salem licensee, PSEG Nuclear, had been conducting visual inspections every other refueling outage at Salem, but because of the discovery of degraded bolts during the current inspection of Salem Unit 1, the licensee decided to conduct the ultrasonic test on that unit now rather than in 2019, as previously planned. Salem Unit 2 has operated for less than 25 effective full-power years and the most recent visual inspection did not identify any issues with baffle-former bolts. At both Indian Point Unit 2 and Salem Unit 1, degraded bolts are being replaced using bolts with material properties less susceptible to corrosion. At Diablo Canyon, operator Pacific Gas & Electric indicated to the NRC that it will inspect the baffles on Unit 1 during its next scheduled outage in spring 2017. With respect to D. C. Cook, Unit 2 observed degradation in 42 baffle-former bolts in 2010, and, as a result, replaced these bolts. A follow-up visual inspection in 2012 revealed no problems. The NRC has discussed the recent findings at Indian Point and Salem with D.C. Cook and discussed plans for future bolt inspections.

Please be assured that the NRC is closely monitoring this issue and will be evaluating whether further regulatory action is needed. As indicated earlier, the NRC staff does not believe that the current circumstances warrant shutting down any U.S. nuclear power plant. If you have any additional questions, please contact me or Eugene Dacus, Director of the Office of Congressional Affairs, at (301) 415-1776.

Sincerely,

/RA/

Stephen G. Burns

Identical letter sent to:

The Honorable Barbara Boxer
Ranking Member, Committee on
Environment and Public Works
United States Senate
Washington, DC 20510

The Honorable Kirsten Gillibrand
United States Senate
Washington, DC 20510

The Honorable Cory Booker
United States Senate
Washington, DC 20510