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June 30, 2016

Victor McCree, Executive Director for Operations
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: 10 CFR 2.206 Petition on Baffle Bolt Degradation at Indian Point

Dear Mr. McCree:

On behalf of the Union of Concerned Scientists (UCS), I submit this petition pursuant to §2.206 in Title 10 of the Code of Federal Regulations (hereafter 10 CFR). We petition the Nuclear Regulatory Commission (NRC) to take three enforcement actions regarding baffle-former bolt degradation at the Indian Point Energy Center.

UCS and its Nuclear Power Safety Mission

Students and faculty members at the Massachusetts Institute of Technology founded UCS in May 1969. The Vietnam War was at its height that year and the heavily polluted Cuyahoga River in Cleveland caught fire. UCS's founders called for scientific research to be directed away from military technologies and toward solving environmental and social problems.

Nuclear power plant safety became one of UCS's first focus areas. Robert D. Pollard was hired in 1976 as the organization's first nuclear safety engineer. Pollard resigned from the NRC to take this position. Pollard had been the NRC's Project Manager for Indian Point Unit 2. He was concerned that the agency was allowing the reactor to start up despite awareness that several unresolved safety problems existed. He selfishly worried he might be held personally liable when an accident harmed workers, the public, and the environment, going as far as consulting an attorney to see whether he could be held financially or criminally responsible. He unselfishly could not accept subjecting workers and the public to the unduly elevated risk from a reactor operating with known safety deficiencies.

UCS has monitored nuclear power plant safety over four decades and engaged the NRC and Congress advocating safety upgrades. UCS does not often advocate that the nuclear safety bar be raised—instead, UCS most often seeks to stop reactors from doing the limbo beneath that bar.[1]

UCS has been monitoring the degraded baffle-former bolts recently discovered at Indian Point Unit 2.[2]

Enforcement Action Requested

UCS requests the following enforcement actions:

1. NRC issue an Order requiring the Indian Point licensee to inspect the baffle bolts and to install the downflow to upflow modification on Unit 2 during its next refueling outage.

[1] Details of UCS's nuclear power safety standard are online at http://allthingsnuclear.org/dlochbaum/ucss-standard-for-nuclear-power-safety
[2] See the All Things Nuclear blog at http://allthingsnuclear.org/dlochbaum/indian-points-baffling-bolts

2. NRC issue a Demand For Information requiring the Indian Point licensee to submit an operability determination to the agency regarding continued operation of Unit 3 until its baffle bolts can be inspected per MRP-227-A.

3. NRC issue a Demand For Information requiring the Indian Point licensee to submit an evaluation of the performance, role and operating experience of the metal impact monitoring system in detecting and responding to indications of loose parts (such as head broken off baffle bolts) within the reactor coolant system.

Justification for Enforcement Actions Requested

Unit 2 Order

As discussed in Section 2.3.5 of the current NRC Enforcement Policy,[3] "An order is a written NRC directive to … take such other action as may be proper." Thus, an order is an enforcement action that can be requested per §2.206 of 10 CFR.

By licensee event report (LER)[4] dated May 31, 2016, the Indian Point licensee informed the NRC about baffle-former bolt degradation discovered on Unit 2. Quoting from the LER:

> "…an **inspection of the reactor vessel internals that is required by MRP-227-A** was performed" [emphasis added]
>
> "Corrective actions for this event include … Perform inspection of the baffle-former bolts in refueling outage 2R23."
>
> "Corrective actions for this event include … Implement a project in refueling outage 2R23 to convert reactor flow configuration from downflow to upflow to improve margin for the baffle-former assembly."

An order is the proper means for ensuring that the bolts are inspected and that the downflow modification is installed during the next refueling outage of Indian Point Unit 2 (i.e., 2R23).

Presently, the Indian Point licensee has committed to undertake these measures during the next refueling outage of Unit 2 as corrective actions for the degraded baffle bolts. But as the NRC wrote in its April 22, 2004, response[5] to Jim Riccio at Greenpeace:

> *In most cases, the agency cannot take formal enforcement actions solely on the basis of whether licensees fulfill commitments, as failure to meet a commitment in itself does not constitute a violation of a legally binding commitment.*

Thus, while the licensee has committed to take these steps during the next refueling outage, there is no enforceable way for the NRC to prevent these steps from being cancelled or postponed to a later time.

As the licensee stated in its LER, baffle-former bolt inspections are required to be performed per MRP-227-A. MRP-227-A[6] is therefore the legally binding document governing when bolt inspections are

[3] Available online at http://www.nrc.gov/docs/ML1502/ML15029A148.pdf
[4] Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML16159A219
[5] Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML040980367
[6] Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML120170453

required to be performed. Table 4-3 of MRP-227-A specifies the following examination method and frequency for baffle-former bolts:

> *Baseline volumetric (UT)* [ultrasonic] *examination between 25 and 35 EFPY* [effective full power years]*, with subsequent examination on a ten-year interval.*

Consequently, while the licensee submitted a non-binding, unenforceable commitment to inspect the bolts during the next refueling outage of Unit 2, the licensee is only legally required to inspect the bolts sometime within the next ten years (roughly five refueling outages).

No legal backstop currently exists for the commitment to install the downflow to upflow modification during the next refueling outage. Consequently, the licensee could cancel the installation or postpone it to a later refueling outage.

UCS requests that the NRC take enforcement action to require that the baffle-former bolts be inspected and the downflow to upflow modification be installed during the next refueling outage. This enforcement action imposes no burden on the licensee, unless the licensee sought to break its promises. The enforcement action essentially provides the NRC and the pubic with a legally binding backstop for the promised corrective actions.

Unit 3 Demand For Information

As discussed in Section 2.3.6 of the current NRC Enforcement Policy,[7] the NRC "may also issue a demand for information … to determine whether an Order … should be issue or whether other action should be taken." Thus, a Demand For Information is an enforcement action that can be requested per §2.206 of 10 CFR.

NRC Inspection Manual Chapter 0326,[8] "Operability Determinations & Functionality Assessment for Conditions Adverse to Quality or Safety," defines the NRC's expectations when degraded or nonconforming conditions are discovered at nuclear power plants. Manual Chapter 0326 Section 04.05 states:

> "Circumstances that require an operability determination:
>
> a. Degraded conditions.
> b. Nonconforming conditions.
> c. Discovery of an unanalyzed condition."

The aforementioned LER dated May 31, 2016, stated:

> "The enclosed LER identifies an event where there was an unanalyzed condition due to degraded baffle-former bolts…".
>
> "The 227 failed bolts and the pattern of failure did not meet the acceptable criteria for plant startup from the 2R22 refueling outage which had been provided by Westinghouse prior to the outage in an analysis of the baffle-former assembly in WCAP-18048-P."

[7] Available online at http://www.nrc.gov/docs/ML1502/ML15029A148.pdf
[8] Available online at http://www.nrc.gov/docs/ML1532/ML15328A099.pdf

Thus, the degraded bolts were an unanalyzed condition that did not conform to the safety analysis for the baffle-former assembly. Meeting any one of the circumstances specified in Manual Chapter 0305 warrants an operability determination—meeting all three simply makes the decision to do one easier.

Manual Chapter 0326 Section 04.04 defines the scope of operability determinations. That scope should include:

> "The SSCs [systems, structures, and components] affected by the degraded or nonconforming condition."
>
> "The extent of condition for all similarly affected SSCs."

The baffle-former bolts on Unit 3 are undeniably "similarly affected SSCs" warranting an operability determination. The bolts on Unit 3 are made from identical materials and exposed to nearly identical environmental conditions and are therefore vulnerable to the same degradation mechanism that affected the Unit 2 bolts. If the bolts were readily accessible during Unit 3's operation, 10 CFR 50 Appendix B would require inspections and/or testing to determine whether they too were degraded and nonconforming. Because the bolts cannot be inspected and tested with Unit 3 operating, an operability determination is the appropriate surrogate means to answer the extent of condition question and ensure safe reactor operation.

Manual Chapter 0326 Section 04.03 describes the Presumption of Operability. It is analogous to the presumption of innocence in criminal trials. The first full paragraph on page 7 explains the limitations on the Presumption of Operability:

> "...it would not be appropriate to presume operability based on the future results of an analysis where there is not a reasonable expectation that the system can perform its specified safety function during the interim."

Indian Point Unit 3 has operated for over 25 effective full power years. Thus, it is in the window defined in MRP-227-A for the baseline volumetric examinations of the baffle-former bolts. But that baseline inspection has not yet been performed. While Unit 3 had operated for less time than Unit 2 had acquired when its baseline inspections were performed during 2R22 and therefore may have less bolt degradation, there is no "reasonable expectation" that the inspections—when finally performed—will identify zero degraded bolts.

The final sentence in the third paragraph under the Description section on page 2 of the LER indicated that replacement of all the degraded bolts on Unit 2 was necessary to restore the unit to a conforming condition that would allow it to be safely restarted—"The consequence of this is that baffle-former bolt replacements were required to be completed prior to returning IP2 back to service." Thus, it is not readily apparent or expected that Unit 3 will have so few degraded bolts as to conform to the analysis in WCAP-18048-P. Consequently, an operability determination is needed to justify continued operation of Unit 3.

Performing an operability determination is not short-hand for shutting Unit 3 down immediately for the volumetric examinations of the baffle-former bolts. That outcome would only be necessary if an operability determination was unable to justify continued operation of the reactor.

Another outcome would be an operability determination that properly evaluated the situation and properly concluded that there was ample reason to expect that the baffle-former bolts had not degraded to the point where safety margins were compromised. In that case, the operability determination would provide a solid, defensible foundation for Unit 3's continued operation.

UCS requests that the NRC take enforcement action to require that the licensee submit an operability determination on the docket for Unit 3's operation with potentially degraded baffle-former bolts. An operability determination is the mechanism established by the NRC to properly evaluate such situations and therefore should be applied in this one.

Metal Impact Monitoring System Demand For Information

As discussed in Section 2.3.6 of the current NRC Enforcement Policy,[9] the NRC "may also issue a demand for information … to determine whether an Order … should be issued or whether other action should be taken." Thus, a Demand For Information is an enforcement action that can be requested per §2.206 of 10 CFR.

Loose Parts Monitoring is described in Section 4.3.6 of the Unit 3 Updated Final Safety Analysis Report[10] as follows:

> *The metal impact monitor was designed to enable early detection of loose metallic parts which may be in the steam generator or the reactor vessel. Upon the occurrence of an impact of loose metallic parts, a pressure wave is generated in the reactor system component causing minute displacements in the component material. The step excitation of the impact produces a broadband frequency response with peak amplitude response at resonant frequencies.*
>
> *Acceleration is measured by the use of special transducers that convert accelerations to electrical signals. These transducers are mounted at specially selected monitoring points on the exterior of the Reactor Coolant System. Monitoring points normally in use during plant operation are at the top and bottom of the reactor vessel and above and below each steam generator tube sheet with transducers mounted on the generator shell. Additional monitoring points are available above and below each steam generator transition cone and above each feedwater nozzle.*
>
> *Every 24 hours and whenever the alarm setpoint is exceeded the impact energy level and rate of occurrence can be displayed on a printer. These records serve to establish a history for establishing when and where impacts were observed. The rate at which impacts occur gives an indication of the amount of debris present in the monitored area while the impact energy is a measure of the weight of the debris*.

Safety Evaluation 98-115-EV-1, Rev. 1[11] was prepared by Westinghouse following detection by the metal impact monitoring system of two parts broken loose from a residual heat removal valve in the reactor vessel's lower plenum. One part was estimated to "weigh less than 2 ounces." The metal impact monitoring system was installed to detect small metal parts loose in the reactor vessel and reactor coolant system. It has reportedly detected small metal parts weighing less than two ounces inside the reactor vessel.

Loose parts monitoring by the metal impact monitoring system is a safety function described in the Updated Final Safety Analysis Report. The NRC reviewed the Final Safety Analysis Reports en route to initially issuing operating licenses for Units 2 and 3. The NRC reviewed the Updated Final Safety Analysis Reports en route to a decision about issuing renewed operating licenses for the reactors. Hence, the safety function performed by the metal impact monitoring system was relied upon by the NRC in the plant's licensing process.

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[9] Available online at http://www.nrc.gov/docs/ML1502/ML15029A148.pdf
[10] Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML12335A425
[11] Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML993610316

But the metal impact monitoring system has not been mentioned by the licensee and the NRC during recent communications regarding the degraded baffle-former bolts, including discussions about the loss of locking tab parts and bolt heads (i.e., small metal parts).

If bolts or their locking tabs broke during reactor operation, the metal impact monitoring system should serve as a safety sentinel alerting workers to this deteriorating situation. The NRC has discussed the fact that a loose part impacting and damaging a fuel rod could be detected by increased radioactivity levels in the reactor coolant. Similarly, a loose part impacting and breaching a steam generator tube could be detected by the primary-to-secondary leakage detection systems. The metal impact monitoring system supplements these detection systems. A loose part might not damage a fuel rod or break a steam generator tube. Thus, the metal impact monitoring system detects small metal parts that have not yet damaged a fuel rod or steam generator tube. If waiting for a damaged fuel rod or broken steam generator were sufficient from a safety perspective, the metal impact monitoring system would not be installed. The system serves a separate, albeit related, monitoring function, but seems to be inadequately performing that safety role.

UCS requests that the NRC take enforcement action to require that the licensee submit information on the performance, role and operating experience of the metal impact monitoring system in detecting small metal parts in the reactor coolant system that could occur from degraded baffle-former bolts.

Petition Logistics

UCS requests the opportunity to meet with the members of the Petition Review Board (PRB) before they convene to determine whether our request can be processed as a petition. We do not anticipate this meeting to require more than 60 minutes. We only envision highlighting the enforcement action requested by our petition and its justification and then answering any clarifying questions the PRB members may have about the petition. UCS requests that our participation in this meeting be provided via a phone bridge.

Sincerely,

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