

October 27, 2014

Dr. Lewis Cuthbert, President  
Alliance for a Clean Environment  
1189 Foxview Road  
Pottstown, PA 19465

Dear Dr. Cuthbert:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am responding to your letter of July 25, 2014, expressing concerns about earthquake risks at Limerick Generating Station, Units 1 and 2 (Limerick). I am also responding to related concerns expressed in the June 12, 2014, letter from Betty and Charlie Shank, research assistants at the Alliance for a Clean Environment (ACE). I have included answers to the ACE concerns in the enclosure to this letter.

The NRC staff continues to conclude that Limerick has been designed, built, and operated to safely withstand earthquakes likely to occur in its region, as discussed in more detail in the enclosure to this letter. In addition, as part of our post-Fukushima lessons-learned activities, the NRC is requiring all licensees to reevaluate seismic hazards at their sites. The staff has confidence that plants can operate safely while more analyses are done. This confidence is based on the agency's understanding of external hazards, reactor design and construction, and the results from previous inspections and assessments. Nuclear power plants have the capacity to withstand earthquakes larger than those assumed in the analyses performed as part of the licensing process. This additional capacity results from nuclear power plants being designed, with safety margins, to withstand the forces of a variety of internal and external events. The NRC staff is satisfied that plants can continue operation without introducing undue risk to public health and safety pending the additional analyses and possible enhancements that might result from those short- and long-term seismic hazards reevaluations. I appreciate your time and attention in reaching out to me to share your views on this matter.

Sincerely,

*/RA/*

Allison M. Macfarlane

Enclosure:  
As stated

cc: Mr. and Mrs. Charles Shank

## **NRC Response to Concerns Regarding Earthquake Risks at Limerick Generating Station, Units 1 and 2**

### **Background**

This enclosure provides the U.S. Nuclear Regulatory Commission's (NRC's) response to concerns regarding earthquake risks at Limerick Generating Station, Units 1 and 2 (Limerick), as discussed in the following letters from the Alliance for a Clean Environment (ACE):

- 1) Letter from Dr. Lewis Cuthbert, ACE President, to the NRC dated July 25, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14216A339).
- 2) Letter from Betty and Charlie Shank, ACE research assistants, to the NRC dated June 12, 2014<sup>1</sup> (ADAMS Accession No. ML14203A491).

### **Seismic Hazards Reevaluation**

As part of the NRC's actions taken in response to the 2011 earthquake and tsunami affecting the Fukushima Dai-ichi Nuclear Power Plant in Japan, the NRC, on March 12, 2012, issued a request for information letter to U.S. nuclear plants (ADAMS Accession No. ML12056A046). This letter required, in part, that plants reevaluate seismic hazards using present-day methods and guidance, and conduct "walkdowns" (visual reviews of the plants' seismic structures, systems and components) to ensure protection against hazards.

ACE raised concerns that the NRC staff used generic information instead of site-specific information as the basis for confidence that Limerick can operate safely until seismic hazards are reevaluated. ACE also raised concerns with the timeframe for completing the seismic reevaluation, the NRC's prioritization for Limerick to complete this effort, and the inability of walkdowns to provide accurate information for structures and components that are inaccessible (e.g., foundations, buried pipes, etc.).

In response to the NRC's request for information letter, Exelon Generation Company, LLC (Exelon) submitted a seismic hazard and screening report for Limerick on March 31, 2014 (ADAMS Accession No. ML14090A236). To support review of Exelon's report, the NRC staff conducted independent seismic hazard calculations for the Limerick site. The staff based these calculations on present day seismic hazard models, which were developed through a multiyear process involving significant technical contributions from academia, industry, and Government agencies including the NRC and the U.S. Geological Survey. Exelon, and all other licensees, used these models in their seismic hazard calculations. In addition to the information in the Limerick Updated Final Safety Analysis Report, the staff used additional local geologic information and data in its own independent calculations.

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<sup>1</sup> The letter from Betty and Charlie Shank is dated June 12, 2014; however, the letter was post-marked July 12, 2014.

On May 9, 2014, the NRC staff issued a letter to nuclear plant licensees regarding the seismic hazards reevaluations (ADAMS Accession No. ML14111A147). This letter provided the results of the staff's screening and prioritization of the March 2014 submittals for the central and eastern U.S. nuclear plants. With respect to Limerick, the staff determined that the plant conditionally "screened-in" for conducting a seismic risk evaluation. Based on the small amount of exceedance between the reevaluated seismic hazard and the current licensing basis in the low frequency range, the NRC placed Limerick in the lowest of three priority groups (Group 3) with respect to the timeframe for completing the risk evaluation. However, as stated in the letter, given the limited level of exceedance of the Group 3 plants, the staff would evaluate the need for licensees to conduct a seismic risk evaluation in order for the staff to complete its regulatory decisionmaking. The letter also stated that, for plants identified as conditionally screened-in, the staff would make a final screening and prioritization determination following interactions with the licensees.

On June 17, 2014, the NRC staff held a public meeting with Exelon to discuss issues resulting from the screening and prioritization of a number of plants in the Exelon fleet, including Limerick (ADAMS Accession No. ML14175A518). During this meeting, differences between the licensee's analyses and the staff's independent analyses were discussed. Exelon submitted supplemental information as a followup to the meeting, by letter dated August 21, 2014 (ADAMS Accession No. ML14234A124). Attachment 2 to the Exelon letter provided supplemental information related to Limerick.

As discussed in a letter dated October 3, 2014 (ADAMS Accession No. ML14258A043), the NRC staff has made a final screening and prioritization determination for Limerick. Based on review of the information provided by Exelon and the staff's independent analyses, the staff has determined that Limerick "screens out," which means that a seismic risk and spent fuel pool evaluation is not warranted for this plant. However, a limited scope evaluation in the high-frequency range will be required, to evaluate high-frequency sensitive components in the plant such as electrical relays to determine if they have sufficient capacity to handle the higher accelerations identified in this range. The detailed requirements for these evaluations are provided in the guidance document "Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic" (ADAMS Accession No. ML12333A170).

As mentioned above, the NRC's request for information letter also requested licensees to conduct walkdowns to identify and address degraded, nonconforming, or unanalyzed seismic conditions and report the results to the NRC. Exelon submitted the initial results of the Near-Term Task Force Recommendation 2.3 seismic walkdowns for Limerick in a letter dated November 19, 2012 (ADAMS Accession No. ML123420141). NRC inspectors used Temporary Instruction 2515/188, "Inspection of Near-Term Task Force Recommendation 2.3 Seismic Walkdowns," (ADAMS Accession No. ML12156A052), to independently verify that the Limerick licensee implemented the seismic walkdowns in accordance with the walkdown guidance. As discussed in the two letters dated April 14, 2014 (ADAMS Accession Nos. ML14058B120 and ML14058B156), the NRC staff found that the licensee performed the walkdowns in accordance with the guidance, verified the plant configuration with the current seismic licensing basis, and addressed degraded, nonconforming, or unanalyzed seismic conditions.

With respect to concerns regarding the scope of the seismic walkdowns, as described in the NRC's request for information letter, the intent of the walkdowns was to, in part, verify the current plant configuration with the current licensing basis. As walkdowns are visual inspections, they did not include inaccessible systems, structures, and components (e.g., foundations, buried piping, etc.). Structures, such as building foundations, are typically confirmed to meet their licensing bases through analyses. In addition, piping systems are confirmed to meet their licensing bases through existing operating reactor programs (e.g., inservice inspection). In contrast to the seismic walkdowns, the intent of the seismic hazard reevaluations was to, in part, perform analyses, using present-day NRC requirements and guidance. Based on the results of the seismic hazard reevaluations, the NRC staff will determine whether additional regulatory actions are necessary (e.g., update the licensing/design basis and systems, structures and components important to safety) to provide additional protection against the updated hazards.

The NRC staff has confidence that Limerick is safe to operate while the additional limited scope high-frequency evaluations are ongoing. On March 12, 2014, the Nuclear Energy Institute provided an Electric Power Research Institute (EPRI) study that estimated fleetwide seismic risk and provided a discussion of the inherent seismic design margins for structures, systems, and components (ADAMS Accession No. ML14083A596). This study concluded that the reevaluated seismic hazards do not represent an overall increase in seismic risk for U.S. plants, and that the current seismic design of operating reactors continues to provide a safety margin to withstand potential earthquakes exceeding the seismic design basis. In its March 31, 2014, seismic hazard and screening report, Exelon confirmed that the conclusions of the EPRI fleetwide study apply to Limerick. The NRC staff has independently reviewed the fleetwide study, as well as the specific information for Limerick, and confirmed that fleetwide seismic risk estimates are consistent with the approach and results used in previously-accepted safety/risk assessments. As a result, the staff has confidence that Limerick can continue to operate safely while additional seismic evaluations are conducted.

### **Limerick Construction Deviations and Nonconformances**

ACE raised concerns regarding deviations and nonconformances during the original plant construction of Limerick. These concerns were previously raised by Mr. Dan Ely during an NRC public meeting held on September 22, 2011, as part of a Limerick license renewal meeting (a summary and transcript of the meeting is in ADAMS at Accession No. ML11272A237). The ACE letter dated July 25, 2014, cited Mr. Ely's testimony during the license renewal meeting (reference transcript pages 66-71) and indicated that deviations and nonconformances found during construction should be reviewed again "in light of what we understand and know today about earthquakes or other anomalies."

In accordance with the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," each nuclear power plant is required to have a quality assurance program. This program applies to the design, fabrication, construction, and testing of the structures, systems, and components of the plant. The quality assurance program requires that measures be established to assure that conditions adverse to quality such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. As a part of its routine inspection of all nuclear power

plants, the NRC staff verifies that licensees are properly implementing the requirements of this regulation.

Conditions adverse to quality, identified during Limerick plant construction, including the spent fuel pool concrete issues, were evaluated at that time, and corrective actions were taken, as necessary (reference ADAMS Accession No. ML1213A152). To the extent that new information becomes available that indicates that there is a condition adverse to quality, appropriate corrective actions will need to be taken. For example, the results of the seismic hazard reevaluation effort, discussed above, could potentially identify plant design issues requiring corrective action. As noted above, the NRC staff has confidence that plants, including Limerick, can operate safely while the seismic hazard reevaluation efforts are completed.

### **Seismic Hazards and Fault Locations**

ACE raised concerns regarding seismic hazards at Limerick, saying that the plant was “built directly on top of fault fractures, so wide in some places that they had to be filled in with cement.”

During original plant licensing, the geology and seismology of the Limerick site was evaluated by the NRC staff and found to be acceptable as detailed in Section 2.5 of NUREG-0991, “Safety Evaluation Report related to the operation of Limerick Generating Station, Units 1 and 2,” dated August 1983.

More recently, the NRC staff reviewed the geologic environment as part of the Limerick license renewal review. As discussed in Section 2.2.3, of NUREG-1437, Supplement 49, Volume 1, “Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Regarding Limerick Generating Station, Units 1 and 2, Final Report,” dated August 2014 (ADAMS Accession No. ML14238A284), three small faults (the Sanatoga, the Brooke Evans, and the Linfield) occur within 2 miles of the site. The Sanatoga fault passes about 1,300 feet to the west of the reactor enclosure area. The Brooke Evans fault passes within 2,800 feet to the south of the plant area. The Linfield fault lies about 2 miles southeast of the site. All three of these faults are associated with the Jurassic-Triassic events, which occurred some 140 to 200 million years ago. Studies of these faults indicate that they have been inactive for at least 140 million years. Thus, none of these faults are active or considered “capable” of producing earthquakes per 10 CFR Part 100, “Reactor Site Criteria,” Appendix A, “Seismic and Geological Siting Criteria for Nuclear Power Plants.”

Section 2.2.3 of NUREG-1437, Supplement 49, also states that, during foundation excavation for the Limerick plant, several features, including shear-fractures with some small offsets (displacement), were encountered. While not unusual for the region, and not posing a hazard to plant structures, these areas were treated as necessary to ensure subsurface stability. Treatment included excavating any soft or otherwise weathered material down to competent bedrock and/or by replacing excavated material with concrete.

### **The NRC's Petition Process**

In a letter to the NRC dated March 31, 2014 (ADAMS Accession No. ML14100A177), ACE raised concerns about earthquake risks at Limerick and requested that the license be revoked. In an e-mail dated April 23, 2014 (ADAMS Accession No. ML14129A184), the NRC staff offered the use of the petition process to address the concerns. The e-mail stated, in part, that:

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 2.206 describes the petition process - the primary mechanism for the public to request enforcement action by the NRC in a public process. This process permits anyone to petition the NRC to take enforcement-type action related to NRC licensees or licensed activities. Depending on the results of its evaluation, NRC could modify, suspend or revoke an NRC-issued license or take any other appropriate enforcement action to resolve a problem.

Both the June 12, 2014, and July 25, 2014, letters from ACE requested that the NRC close the Limerick plant based on concerns regarding earthquake risk. However, the letter dated July 25, 2014, stated that ACE rejects use of the NRC's petition process to address its concerns. Nevertheless, the NRC staff believes the 10 CFR 2.206 petition process is the appropriate process to address requested enforcement-type action.

Safety concerns associated with NRC licensed facilities can also be addressed through the NRC's allegation program. Information regarding this program and how to report a safety concern is available at the following link: <http://www.nrc.gov/about-nrc/regulatory/allegations-resp.html>.

### **Assertions Regarding Improper Conduct by the NRC Staff**

The letters from ACE dated June 12, 2014, and July 25, 2014, raised a number of assertions regarding improper conduct by the NRC staff. As such, we have referred the letters to the NRC's Office of the Inspector General (OIG) for appropriate action. Further information regarding the OIG is available at the following link: <http://www.nrc.gov/insp-gen.html>. These concerns include the following:

- The NRC "apparently dismissed the specific evidence provided to [the] NRC from ACE." The information being reviewed by the NRC at Limerick is based on "self-serving and deceptive seismic reports generated by Exelon."
- The NRC has to "seriously consider and take action on the extensive detailed evidence" ACE sent to the NRC staff in its March 31, 2014, letter and attachments.
- The NRC's choice to ignore the Limerick seismic and construction risks, while the seismic revaluation is completed, is "beyond negligent, unacceptable, and clearly NOT protective of public health and safety."
- The NRC has "abandoned its original mission to protect public safety."

- NRC inspectors are “routinely rotated” which leads to a loss of institutional memory at Limerick. As such, “Limerick’s historic hidden weaknesses and unfixable defects continue to increase, unrecognized by inspectors as Limerick ages.”
- Limerick’s NRC inspectors “have been largely unaware of extremely dangerous conditions that exist outside their narrowly designed sphere of specified oversight.”
- NRC inspectors “are not encouraged to question the corporate version of Limerick’s events or conditions.”