Responses to Requests for Information from Representative Edward J. Markey
Letter of August 30, 2012

1. **The August 12, 2012, shutdown of Palisades was planned in order to investigate an unidentified leak in the Primary Coolant System that had reached a rate of 0.3 gallons per minute and rising.**

    a. **When was this leak first discovered? When was it first reported to the NRC? How long was the leak rate at 0.3 gallons per minute?**

The existence of a leak was first identified on July 13, 2012, following the reactor's restart on July 10th from an outage that had been required for repairs to the Safety Injection Refueling Water Storage Tank (SIRWT). The source of the leak was not known at that time. Because NRC inspection procedures require unidentified leakage (which is how this leak was originally classified) to be reviewed daily, the NRC learned of this leak the same day it was detected. The technical specification limit for this unidentified leakage is a rate of 1 gallon per minute (gpm). The leak rate reached 0.3 gpm on July 31, 2012. The leak rate varied between 0.275 gpm and 0.383 gpm between July 31 and the subsequent plant shutdown on August 12, 2012.

    b. **Exactly how was the leaked coolant water disposed of?**

Coolant water, in the form of steam, that exited the reactor coolant system through the crack condensed in the immediate area and drained to the containment sump. Material entering the containment sump is either processed and recycled or is disposed of using radioactive waste handling procedures. No material escaped containment or entered the environment.

2. **Regarding the steam leak in the Control Rod Drive Mechanism that was discovered during the August 12, 2012, shutdown of Palisades:**

    a. **What was the cause of the leak? Have the necessary repairs been made? If not, when will they be performed? How and when will the NRC verify that the repairs have been completed?**

The licensee identified the leak to be in the housing of control rod drive mechanism (CRDM) 24. The crack was approximately 1/8 inch in length on the outside wall of this housing, at a point approximately 2 feet above the reactor head. The leak was from the reactor coolant system pressure boundary; the technical specification limit for pressure boundary leakage is 0 gpm. The NRC resident inspectors and the agency's Special Inspection Team monitored the licensee's activities to determine the source of the leak, the repair process, and post-repair testing, as well as analysis and inspections to determine if other CRDM housings may be susceptible to similar failures. The licensee replaced and tested the new CRDM 24 housing.

Although a root cause investigation has not yet been completed by the licensee and reviewed by the NRC, based on laboratory and nondestructive examination of the leaking CRDM 24 housing, the licensee concluded that the CRDM 24 housing experienced a form of transgranular stress corrosion cracking, which resulted in a through-wall crack. This type of cracking occurs in stainless steel components under certain environmental conditions. This cracking phenomenon originates on the inside diameter of a component and propogates outward. The licensee conducted analyses and inspections to determine if other CRDM housings may be susceptible to the same failure. This included inspecting eight additional CRDM housings to determine if any of the other CRDM housings have similar cracks. These inspections identified

no additional cracks. In response to NRC questions about some of the inspections and analyses, the licensee performed additional testing to ensure the plant was safe to start up.

The NRC verified the completion of repairs by observing the replacement and subsequent testing of the CRDM 24 housing. The licensee is currently evaluating the frequency of additional inspections related to the CRDM housings. The NRC will review this information to ensure the inspections are adequate. The NRC team, including regional and headquarters experts, also conducted a detailed independent review of the technical evaluations that were performed to ensure the CRDMs' structural integrity met the applicable codes and standards. A summary of meetings held on August 24 and 28, 2012, to discuss this matter can be found in the NRC's Agencywide Documents Access and Management System (ADAMS) at accession number ML12243A519.

b. Please explain how this leak may be similar or otherwise related to the leaks discussed in the Union of Concerned Scientists' July 16, 2010, brief entitled "Headaches at Palisades: Broken Seal & Failed Heals"? If it is not related, please provide a full explanation of the differences.

The leaks discussed by the Union of Concerned Scientists' July 16, 2010, brief were related to the CRDM seals. The CRDM seal is located within the seal housing on the upper portion of the CRDM, and is not part of the reactor coolant system pressure boundary. The degradation or failure of a CRDM seal cannot result in a rapid failure of the reactor coolant system pressure boundary. Therefore, CRDM seal leakage is not considered pressure boundary leakage. The seal is designed to accommodate a small amount of leakage to prevent catastrophic failure of the seal from overheating. NRC regulations allow a small amount of leakage through components such as CRDM seals because it is captured by collection systems or a sump or collecting tank. The technical specification limit for the leakage on this component is 10 gpm. The licensee has always shut down the plant before leakage approached this limit.

Alternatively, the most recent CRDM housing leak was a through-wall crack located near weld number 5 and was pressure boundary leakage. The pressure boundary is not designed to allow any leakage, and a through-wall crack may propagate quickly. Therefore, NRC regulations do not permit any leakage through pressure boundary components and the technical specification leakage limit for this location is 0 gpm.

c. Based on the informal communication between my staff and staff at NRC, I understand that the licensee replaced the leaking Control Rod Drive and inspected others for cracks and performed additional analysis and actions to ensure that the plant, if restarted, could operate safely. Please provide the full details and results of these inspections, analyses, and actions.

The licensee has replaced the CRDM 24 housing with a housing of a different design and verified that the plant can operate safely. Prior to plant restart, the licensee conducted testing on eight other CRDM housings to determine if they exhibited indications of similar degradation and found none. However, the NRC concluded that the initial testing of the other eight housings did not include adequate coverage of the potentially affected area. In response to NRC questions, these housings were retested with extended coverage of the affected areas to ensure the plant was safe to start up. The NRC's questions are available in the document titled "Summary of the August 24 and August 28, 2012, Meetings regarding Palisades Nuclear Plant Control Rod Drive Mechanism (CRDM) 24," (NRC ADAMS accession number ML12243A519).

Actions taken by the licensee and reviewed by the NRC include:

1. Nondestructive examination (ultrasonic examination) of the CRDM 24 housing in the area adjacent to the leak to detect both axial and circumferential cracking.
2. Destructive examination of the CRDM 24 housing, including dye penetrant examination to confirm the prior ultrasonic testing results, dimensional tolerance analyses, and fractography. Some of these analyses are still ongoing.
3. Nondestructive examination of eight additional CRDM housings in the immediate area of the leak for both axial and circumferential cracks.
4. Additional nondestructive examination of the same eight additional CRDM housings for axial cracks over a larger area of the housing.
5. Mathematical analysis of thermal expansion of internal components as compared to the housing.
6. Attempts to correlate potential crack initiating characteristics between the CRDM 24 housing and other CRDM housings.

Given that these examinations and analyses did not produce any adverse results, and no information indicated that the additional housings inspected had failures similar to the CRDM 24 housing, the licensee restarted the plant.

The licensee is currently evaluating the potential crack probability and growth rates for these CRDM housings to determine the frequency for future inspections on the CRDMs. The licensee's crack growth analysis will be an important determining factor of the timeline of the licensee's future inspections of the CRDMs, and the licensee's root cause report will be important in determining the scope of future CRDM housing inspections. The NRC evaluated a conservative timeline for the crack growth to be approximately 24 months, with six heat up cycles. Further analysis is being performed to aid in determining the crack growth rate as part of its root cause analysis. The NRC will review the licensee's evaluation to ensure inspection frequency is adequate.

At this time, the NRC staff is satisfied the plant can operate safely. The NRC staff will evaluate the licensee's root cause evaluation report and make sure the results are properly considered in any actions going forward to ensure continued safety.

d. It is also my understanding that Palisades is now operational. When was the decision made to restart the plant? How was that decision made? When exactly did the plant restart?

The licensee decided to restart the plant on August 28, 2012, after it had completed CRDM 24 replacement and extent of condition evaluation. (See details of licensee and NRC actions in response 2(c) above.) The reactor was made critical on August 29, 2012, and the main generator was synchronized to the grid on August 30, 2012.

e. Are you satisfied that the licensee's actions to resolve the Primary Coolant System leakage are sufficient to prevent similar leaks in the future? If yes, why? If not, why not?

Based on the above information, the NRC believes that the licensee's actions to repair the CRDM 24 leak were reasonable. As noted above, the NRC will continue to review additional information related to the CRDM 24 housing to ensure the plant is operated safely. In addition, a periodic inspection plan likely will be needed, given the evidence of degradation. The need for

such an inspection program, its frequency, and its extent will become clearer as the licensee's investigation is completed. The NRC will address longer term issues over the coming weeks based on our assessment of the results of the licensee's evaluation. Based on the time required for the crack to grow through wall (a minimum of 2 years), the NRC finds no basis to require immediate resolution of the longer term issues.

3. My letter sent on June 22, 2012, was in response to a June 12, 2012, shutdown of the Palisades reactor due to a leak in the safety injection refueling water storage tank. The tank is a source of borated water for activities during refueling outages and also supplies the Emergency Core Cooling Systems and the Containment Spray System during emergencies. The leak had been known for at least a year prior to that shutdown. I appreciate your response to that letter. I do, however, have several follow-up questions prompted by your response:

a. In response to my request for the NRC to provide a copy of the safety culture assessment report, you provided the executive summary. Please provide the full report. If you do not have the full report, please request that the licensee provide you with a copy and include it with your response to your letter.

A critical element in the conduct of safety culture surveys is confidentiality. Employees must believe that they can share their observations in complete confidentiality for the sole purpose of improving the quality of their workplace. Without this assurance, employees will not participate in the survey and the information needed to improve performance and enhance safety would be lost. That confidentiality is one of the reasons that, consistent with Reactor Oversight Process procedures, NRC staff reviewed the safety culture assessment at the plant site. The NRC has no regulatory need to possess the assessment; hence, we are not requesting that the licensee provide it. Therefore, the document is not included with this response.

b. In response to my request for the NRC to provide a copy of the presentation entitled "Palisades Nuclear Power Plant Safety Culture Assessment Results," dated April 5, 2012, your response stated that "The NRC does not have a copy of the licensee's presentation related to the assessment result." Please request that the licensee provide you with a copy of this presentation and include it with your response to this letter.

The NRC does not have possession of the subject licensee presentation and does not have a regulatory need to possess and review this document; hence, we are not requesting that the license provide it. Therefore, the document is not included with this response.

4. When speaking about the leak that caused the June 12, 2012, shutdown of Palisades, Entergy spokesman Mark Savage claimed that no pails or buckets were ever used to collect the radioactive leaked water, but that "containment basins" were used. However, in the NRC response to my June 22, 2012, letter, it is stated that both a 1-liter bottle and a 5-gallon bucket were used to collect leaked water. Moreover, it is unclear to me what practical, functional difference exists between a pail, bucket, bottle or containment basin in the first place.

a. In May 22, 2007, then-NRC Chairman Greg Jaczko stated that "Not only does the public need to have access to the same information that we have, but they have to have access to understand the decision-making process we use as a regulatory body." Do you agree with Dr. Jaczko's statement? If so, how do you reconcile

Dr. Jaczko's statement with Entergy's public statement? If you do not agree with Dr. Jaczko's statement, why not?

The NRC agrees with the need for public openness especially in areas of regulatory and/or technical significance. In the present case, the NRC focus was on the safe collection and disposal of the leakage. That was accomplished appropriately and no related NRC action was warranted.

b. What NRC policies are in place to ensure that licensees provide the public with truthful statements?

Title 10 of the *Code of Federal Regulations*, Section 50.9 requires the licensee to provide to the NRC complete and accurate information in all material respects. In this case, any statements regarding the types of containment devices would not be considered material to the NRC. NRC regulations and policies do not directly address the adequacy of licensee information provided only to the public and not to the NRC.

5. Former NRC Chairman Greg Jaczko toured the Palisades plant on May 31, 2012, but he was reportedly not made aware of the leak of water into the control room prior to or during this inspection. After the leak caused the plant to shut down two weeks later and he became aware of the issue, then-Chairman Jaczko asked the NRC's Office of Investigations to examine why the leak was not disclosed at the time of his visit. Commissioner William Ostendorff, however, objected to the inquiry and demanded it be halted, calling it a "waste of agency resources."

a. Has the NRC's Office of Investigations commenced an examination into this matter? If not, why not, and will you request that it immediately do so?

On June 25, 2012, the NRC Office of Investigations self-initiated an investigation to determine whether officials of Entergy Corporation, owner of the Palisades Nuclear Generating Station, provided complete and accurate information to the NRC regarding leakage from the safety injection refueling water tank, including leakage into the control room. The investigation is ongoing.

b. Please provide details of the status of the leak (e.g. leak rate, water collection method) at the time of then-Chairman Jaczko's May 31, 2012, visit.

There was no control room leakage at the time of former Chairman Jaczko's May 25, 2012, visit. On that date, the licensee recorded a leakage rate from the SIRWT of 20 gallons per day into areas of the plant that were adjacent to the control room, but not generally accessed by personnel. All of this leakage was collected by the licensee, measured for the purpose of trending the leak, and disposed of as radioactive waste. Leakage into the control room had previously occurred in May 2011 (less than 0.08 gpd – approximately 1.25 cups per day) and in early May 2012 (very small quantity), and subsequently, in June 2012 (also a very small quantity associated with tank repair activities).

c. On what date was the NRC first made aware of the leak and in what form was this information transmitted? Please provide copies of all documents (including but not limited to memos, letters, emails, phone or meeting logs) related to the manner in which the NRC first learned of this leak.

The NRC was initially informed by the licensee of leakage into the control room on May 19, 2011. On May 18, 2011, the licensee observed leakage into the control room (the licensee's estimate was 0.08 gallons per day) during the night shift after heavy rainfall and verbally notified the NRC senior resident inspector the following morning. The licensee initially attributed the leakage to roof leaks due to the rain, but investigated other sources for the leak. The leakage was from a seam along the ventilation duct in the far left corner of the control room and did not impinge on main control room equipment. The reported extent of leakage and location in the control room was consistent with NRC inspector observations in the control room the next morning after receiving the report of leakage.

Attached is an email from the senior resident inspector to his branch chief in NRC Region III documenting the notification. There is no additional written documentation.

6. **Entergy's license to operate Palisades was renewed on January 17, 2007, extending its licensee from 2011 to 2031. In less than six years since the license was renewed, the NRC has issued six Escalated Enforcement Actions to Palisades. This history and the recent safety culture assessment do not inspire confidence that Palisades will be able to operate safely for the more than 19 years left in its operating license.**

   a. **Are you confident that the Palisades Nuclear Generating Station can safely operate for the remainder of its license term? Please provide a detailed explanation.**

If at any time the NRC does not have reasonable assurance that a nuclear power plant can be operated safety, it has the authority to modify, suspend, or revoke an initial or renewed license.

The NRC provides ongoing oversight of the safety of all commercial nuclear power plants, regardless of whether they hold or have applied for a renewed license. One of the programs the NRC employs to provide that oversight is the Reactor Oversight Process. The Reactor Oversight Process uses a variety of tools and inspection techniques to monitor and evaluate licensee performance. The process focuses on those plant activities that are most important to safety. Specifically, the Reactor Oversight Process consists of three key strategic performance areas: reactor safety, radiation safety, and safeguards. Within these strategic performance areas are the essential safety cornerstones of facility operation: initiating events, mitigating systems, barrier integrity, emergency preparedness, public radiation safety, occupational radiation safety, and security. Satisfactory licensee performance in the cornerstones provides reasonable assurance that the facility is operating safely and that the NRC's safety mission is being accomplished.

The NRC continuously assesses plant performance in each cornerstone by analyzing two inputs: NRC inspection findings and performance indicators reported by the licensee. Both inspection findings and performance indicators are evaluated and given a color designation based on their safety significance. Green inspection findings indicate a deficiency in licensee performance that has very low risk significance with little or no impact on safety. Green performance indicators represent acceptable performance in which cornerstone objectives are fully met and likewise have little or no impact on safety. White, Yellow, or Red inspection findings or performance indicators each, respectively, represent a greater degree of safety significance and therefore result in increased NRC attention in accordance with the Reactor Oversight Process Action Matrix.

The Reactor Oversight Process calls for reactive and supplemental inspections in response to events or degraded performance issues such as the recent issues at Palisades. These inspections provide assurance that safety issues will be effectively identified and resolved.

The Reactor Oversight Process is a mature, effective oversight process. However, the staff continues to refine it in response to emerging issues, lessons learned, and suggested improvements from internal and external stakeholders. The NRC staff performs an annual self-assessment of the Reactor Oversight Process to evaluate its effectiveness against pre-established measures related to the program goals of being objective, risk informed, understandable, and predictable. The staff also evaluates industry trends to monitor the safety performance of operating reactors as an additional indicator of Reactor Oversight Process effectiveness.

Regarding the safety of nuclear power plants in the period of extended operation, the NRC's primary focus during the license renewal process is aging management. Each license renewal application must contain technical information regarding the plant's systems, structures, and components; their material composition; the environment that they are exposed to; and the applicable aging effects for each material and environment combination. In addition, license renewal applicants must demonstrate that they can adequately manage such effects through their aging management programs. The NRC staff performs a safety review of the information in the application and determines whether the applicant can adequately manage the effects of aging such that the plant can be operated safely during the period of extended operation. To support its evaluation, the NRC uses its Generic Aging Lessons Learned Report, along with other relevant generic and plant-specific operating experience. The Generic Aging Lessons Learned Report is a systematic compilation of plant aging information and describes over 50 programs acceptable to the NRC staff for managing the effects of aging. The NRC staff performs inspections and audits during the license renewal process and performs follow-up inspections to verify implementation of aging management programs. As you noted, the NRC renewed the license at Palisades in 2007. Based on the NRC's review, the staff concluded that all relevant requirements for relicensing had been met, indicating that the plant could continue safe operations during the renewal period. A renewed license is not a guarantee that a facility will operate for the entire renewed license term.

Attachment: As stated