Three questions and the answers

Your questions and our answers are provided below:

1. *In recent years, plants have exhibited better fuel performance and improved chemistry resulting in less primary coolant radioactivity concentrations than was assumed when plants were originally licensed. In light of this NRC statement and the NRC safety assessment of Region II concerns regarding the discrepancies of containment radiation monitor sensitivities at St. Lucie and Turkey Point (June 24, 1998, ADAMS ML011760038), has NRC been aware for the last four years that plants are operating outside the condition of their licenses?*

Regulatory Guide (RG) 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems," is not a license condition but it is part of the current licensing basis for some plants. We are aware that plants may occasionally operate outside their licensing bases and we expect licensees to take appropriate actions as required. Appropriate actions may include entering applicable technical specification action statements, revising the safety analysis report pursuant to 10 CFR 50.59, and if necessary, informing the staff in accordance with 10 CFR 50.72(b) or 50.73(a)(2)(i). We also rely on our own inspection staff to help monitor and provide further assurance that plants are being operated within their licensing bases.

We have discussed the issue of operability and meeting the guidance of RG 1.45 at reduced coolant activity levels in a number of safety evaluations (as you are probably aware, RGs are not regulatory requirements). In a June 18, 1996, safety evaluation for ANO, Unit 2, the staff concluded that although the airborne particulate and gaseous radioactivity monitors may not at times be capable of detecting 1 gpm within 1 hour, they were designed in accordance with the sensitivities specified in RG 1.45. RG 1.45 recommends using instruments with sensitivities of 10^{-9} microcuries per cubic centimeter (µCi/cc) for air particulate monitoring and 10^{-6} µCi/cc for the gaseous monitoring. Since the applicable monitors meet the specified sensitivity, they are designed in accordance with RG 1.45. The staff's overall conclusion was that the leakage detection systems at ANO, Unit 2, were consistent with the guidelines of RG 1.45. A similar conclusion was drawn by the staff in a June 14, 1999, safety evaluation for the Crystal River, Unit 3 leakage detection systems where the gaseous radioactivity monitor was only capable of detecting a 1-gpm leak rate within 14 hours. In both of these cases (modifications were made at ANO, Unit 2) the sump level/flow monitoring systems were capable of detecting a 1-gpm leak rate within 1 hour.

It is not necessary to detect a 1-gpm leak rate within 1 hour in order to achieve the goal of reasonable assurance that such leaks will be detected in time to prevent large piping failures. For instance, Generic Letter (GL) 84-04, "Safety Evaluation of Westinghouse Topical Reports Dealing With Elimination of Postulated Pipe Breaks in PWR Primary Main Loops," recognized that having one leakage detection method operable that could detect a 1-gpm leak rate within 4 hours provided sufficient safety margin to support LBB approval. Likewise in a number of safety evaluations, the staff recognized that an airborne gaseous radioactivity monitor that could detect

a 1 gpm leak rate within a 9-18 hour period was acceptable. This was based on the availability of other detection methods, including a sump level/flow monitoring system that was capable of detecting a 1-gpm leak rate within 1 hour.

We understand that significant decreases in radioactivity levels at many, if not all, of the plants, have created inconsistencies between what we find acceptable and what is stated in RG 1.45 and we need to reconsider the prioritization of a first revision to RG 1.45. However, it is also prudent to wait for the completion of the generic studies associated with the events at V.C. Summer and Davis-Besse to determine if new requirements are necessary.

You also referred to the upcoming generic activities referenced by the staff in the NRC safety assessment of the Region II concerns at St. Lucie and Turkey Point (TIA-019), and stated that you have been unable to find the results of these activities in the public domain. Please refer to the status of ongoing generic activities discussion which follows our answer to Question 3.

2. *In light of a number of Licensee Event Reports (LERs) where plants have been unable to meet the requirements of Regulatory Guide 1.45, what reasonable assurances, based on objective data, can NRC provide the public that General Design Criterion (GDC) 30 is being met?*

GDC 30 requires that "means shall be provided for detecting and, to the extent practical, identifying the location of the source of the reactor coolant leakage." As discussed in our response to Question 1 above, the staff believes that the intent of RG 1.45 is being met at all plants; therefore, there is reasonable assurance that GDC 30 is being met. Furthermore, when considered in conjunction with other diverse and possibly less sensitive leakage detection methods, the availability of at least one detection method that is capable of detecting a 1-gpm leak rate increase within 1 hour (or 4 hours in some cases) provides adequate LBB detection capability. In addition to the particulate and/or gaseous radioactivity monitor, plants are equipped with a sump level and/or sump flow monitor which is usually capable of detecting a 1-gpm leak rate within a 1- to 4-hour period. Some plants may also have containment cooler condensate flow-rate monitors with the same sensitivity. In addition, as discussed in RG 1.45, there are a number of other leakage detection methods available that are not included in the plant technical specifications that contribute to the assurances that GDC 30 is being met.

3. *The Technical Specifications (TS) allow a small amount of unidentified leakage, typically 1 gpm. The TS do not allow any RCS pressure boundary leakage. This may introduce a non-conservatism since operators may not be able to distinguish between unidentified leakage and the RCS pressure boundary leakage. In other words, how do they know it is not pressure boundary leakage?*

Since it is impractical, as discussed in RG 1.45, to eliminate all unidentified leakage, a 1-gpm limit for unidentified leakage at PWRs is conservative with respect to detection capability and known normal leak rates. Based on our experience, at many PWRs, the normal unidentified leak rate is somewhere between 0.1 and 0.3 gpm. The normal unidentified leak rates usually remain relatively constant following plant startup and a reasonable run-in time.

When an increase over this base rate occurs the leakage is initially classified as unidentified. As you suggest in Question 3, even though a possibility exists that the base leak rate and/or any increase over the base rate could be pressure boundary leakage, the 1-gpm technical specification limit minimizes the risk associated with that possibility. This is because, when you consider the through-wall flaw size necessary to provide 1 gpm of leakage, it is unlikely that such a flaw will grow to a size which could significantly threaten reactor coolant pressure boundary integrity under design basis conditions prior to being detected. Furthermore, based on our experience, we believe licensees are sensitive to this leak rate and generally do not wait until the 1-gpm limit is reached before taking actions to identify the source of any increase in leakage and taking appropriate action, including shutting down if necessary.

By virtue of the technical specifications, the staff does not allow plants to operate with any known primary pressure boundary leakage (0 gpm required by technical specifications). However, we do allow plants to operate with limited unknown leakage (up to 1 gpm for PWRs) as discussed above.

Status of Generic Activities Related to RCS Leakage

In your letter you referred to the generic activities mentioned in the staff's June 24, 1998, safety assessment of Region II concerns (TIA-019) about discrepancies in the containment radiation monitor sensitivities at St. Lucie Units 1 and 2, and Turkey Point Units 3 and 4. You also referred to Information Notice (IN) 2000-17, Supplement 2, "Crack in Weld Area of Reactor Coolant System Hot Leg Piping at V. C. Summer," dated February 28, 2001 in which the staff discusses other generic activities. You expressed concern that you could not find the results of any of these activities in the public domain. The results are not available in the public domain because these activities have not been completed. The following discussion describes the status of these activities and other related issues.

In TIA-019 the staff stated that the Office of Nuclear Regulatory Research was developing a regulatory guide (RG) for LBB to establish updated regulatory guidance on experience gained over the past years in the application of LBB technology. The basis for the RG is NUREG/CR-6765, "Development of Technological Basis for Leak-Before-Break Evaluation Procedures." It will be issued in the near future and will be available at the NRC public web site (http://www.nrc.gov).

In IN 2000-17, Supplement 2, the staff identified four generic issues:

- potential weaknesses in the ability of ASME Code-required nondestructive examination techniques to detect and size small inner-diameter stress corrosion cracks

- potential weaknesses in the ASME Code in that it allows multiple weld repairs which affect residual weld stress and primary water stress corrosion cracking (PWSCC)

- potential weaknesses in RCS leak detection systems

- questions regarding the continued applicability of "leak before break" analyses.

Work on the leak detection issue will begin when the other three issues are resolved. This is due to the possibility that the other issues could lead to new insights regarding the necessary sensitivity of RCS leakage detection systems.

With respect to revising RG 1.45, “Reactor Coolant Pressure Boundary Leakage Detection Systems,” the staff’s intention was to eventually revise it to include newer methodologies and to address the outcome of ongoing and/or future activities associated with LBB technology. However, this effort will involve considerable time and effort. In the meantime we are considering an interim revision to address the detector sensitivities associated with the actual coolant activity levels existing at power plants today. The current RG 1.45 specified sensitivity of radiation detection systems (a 1-gpm leak rate in 1 hour) was based on expected activity levels as identified in the individual plant’s environmental report. Based on our current understanding of reactor coolant pressure boundary (RCPB) degradation mechanisms and LBB technology, the detection of a 1-gpm leak rate in a 1-hour time frame is not critical to maintaining RCPB integrity and the detector response time could be extended.