State of New Jersey

Richard J. Codey
Acting Governor

Department of Environmental Protection
PO Box 402
Trenton, NJ 08625-0402

Bradley M. Campbell
Commissioner
Tel. # (609) 292-2885
Fax # (609) 292-7695

August 25, 2005

Edith Gbur, President
Jersey Shore Nuclear Watch
P.O. Box 3085
Toms River, NJ 08756-3085

Dear Ms. Gbur:

I am writing in response to your July 20, 2005 letter regarding the Oyster Creek Nuclear Generating Station's drywell corrosion monitoring program.

The New Jersey Department of Environmental Protection's Bureau of Nuclear Engineering has closely followed the drywell corrosion issue at Oyster Creek since it was identified in the 1980's. As you are aware, Oyster Creek has in place an ongoing, formalized inspection program to monitor the condition of the drywell. Two types of inspections are conducted. One type is an ultrasonic inspection of portions of the drywell, including both the upper drywell region, sometimes referred to as the cylinder region and the lower drywell region, sometimes referred to as the spherical shell. The second is visual inspection of the drywell coating which was applied in the region referred to as the sand bed region. The coating prevents corrosion in the drywell sand bed region but must be periodically inspected to confirm the coating's condition. The uncoated portions of the drywell remain susceptible to corrosion, hence critical drywell areas must be periodically inspected by ultrasonic testing to determine the current drywell wall thickness.

The potential for ongoing drywell corrosion represents an issue of concern, especially as it relates to aging of the plant and considering that Oyster Creek has applied to the Nuclear Regulatory Commission (NRC) for an extension of its operating license for an additional 20 years beyond the current license's expiration date of April, 2009. In response to our concerns, Oyster Creek provided a brief report titled "Assessment of Primary Containment Drywell Corrosion for the Period of Extended Operation." A copy of this report is enclosed.

With respect to the difficulty you are experiencing in obtaining drywell corrosion inspection program results, an engineer from the Bureau of Nuclear Engineering has met with the Oyster Creek Site Regulatory Assurance Manager, Jhansi Kandasamy, and discussed the availability of the information you desire. Ms. Kandasamy agreed to speak with you directly and make available to you the information you seek. She can be reached at (609) 971-4754.

Thank you for writing and sharing your concerns with me.

Sincerely,

Joanna Dunn Samson, for
Bradley M. Campbell
Commissioner

Enclosure

Assessment of Primary Containment Drywell Corrosion
For the Period of Extended Operation

Oyster Creek License Renewal Review

1. Issue: How will corrosion of the primary containment drywell be monitored during the period of extended plant operation?

The primary containment is a General Electric Mark I design and consists of a drywell, a pressure suppression chamber, and a vent system connecting the drywell and the suppression chamber. The drywell is a steel pressure vessel, in the shape of an inverted light bulb, with a spherical section and an upper cylindrical section. The spherical section is partially embedded in reinforced concrete and transitions into the non-embedded section through a sand bed region. The non-embedded portion of the drywell is enclosed by a reinforced concrete shield wall, separated by a gap designed to allow for expansion of the drywell shell.

The primary containment is a safety related structure, required to control the release of fission products to the secondary containment in the event of a design basis loss-of-coolant accident (LOCA) so that off site consequences are within acceptable limits (Ref. 5.3).

The potential for corrosion of the drywell was first recognized in 1980 when water was noticed coming from the sand bed drains. Water leakage from the sand bed drains indicates the potential for a moist environment in contact with exterior surfaces of the drywell shell. Extensive investigations to identify the source of water and the leak path were undertaken during the 1980, 1983, and 1986 refueling outages (Ref. 5.1, 5.2, 5.3). Results of the investigation indicated that:

- Leakage was observed during refueling outages;
- Leakage was attributed to cracks in the reactor cavity liner; and
- The leakage path was through the seismic/expansion gap between the drywell and the reactor building, down to the sand bed region within the reactor building.

To determine if water leakage had an adverse effect on the drywell shell, a series of ultrasonic testing (UT) measurements of the drywell shell thickness were made. Results of UT measurements confirmed that:

- Corrosion was occurring in the sand bed region and in the upper regions of the drywell.
- The most severe corrosion was found in the sand bed region (35.2±6.8 mils/year) (Ref. 5.4).
- The highest corrosion rate above the sand bed region was 4.6±1.6 mils/year (Ref. 5.4).

2. Corrective Actions:

Upon identification of drywell corrosion, several corrective actions, including the following, were initiated in 1980 to:

- Prevent water intrusion into the sand bed region.
    - ♦ Apply strippable paint to the reactor cavity walls liner during refueling outages; and
    - ♦ Monitor leakage of water from the sand bed region drains.
- Determine the extent of corrosion and wall thinning.
    - ♦ Take additional UT measurements to identify areas that exhibited worst metal loss and map them for future monitoring; and
    - ♦ Take core samples of the drywell shell to validate UT results.
- Arrest accelerated corrosion in the sand bed region.
    - ♦ Install a cathodic protection system to prevent corrosion. (The system was later determined to be ineffective and removed from service);
    - ♦ Remove sand and corrosion products from the sand bed region; and
    - ♦ Apply protective epoxy coating to the exterior surfaces of the drywell in the sand bed region.
- Establish a corrosion allowance by demonstrating, through analysis, that the original drywell design pressure was conservative.
- Establish a drywell corrosion-monitoring program to ensure that loss of material is detected, evaluated, and that required corrective actions are taken before the primary containment intended function is adversely impacted. The program's elements are as follows:
    - ♦ Periodic UT inspections of the shell thickness at critical locations;
    - ♦ Calculations which establish conservative corrosion rates;
    - ♦ Projections of the shell thickness based on the conservative corrosion rates;
    - ♦ Demonstration that the minimum required shell thickness is in accordance with applicable ASME Code requirements; and
    - ♦ Periodic monitoring of protective coating of the exterior surfaces of the drywell in the sand bed region.

3. Corrosion Assessment:

Evaluation of UT measurements at the four monitored elevations taken through the year 2000 concluded that the corrective actions are effective in reducing corrosion rates. The measurements show that:

- Corrosion is no longer occurring at two (2) elevations, which previously experienced corrosion.
- A third elevation is subject to a corrosion rate of 0.6 mils/year.
- A fourth elevation is subject to a corrosion rate of 1.2 mils/year.

Recent UT measurements (2004) confirmed that corrosion rates continue to decrease:

- Two elevations that previously exhibited no increase in corrosion continue the "no corrosion" trend;
- Rate of corrosion for the third elevation decreased from 0.6 mils/year to 0.4 mils/year; and
- Rate of corrosion for the fourth elevation decreased from 1.2 mils/year to 0.75 mils/year.

Inspection of the protective coating on exterior surfaces of the drywell in the former sand bed region (1996, 2000, and 2004) confirmed that corrosion has been arrested and that the coating is performing satisfactorily.

4. Conclusion:

These corrosion assessment results demonstrate that corrective actions taken at Oyster Creek have been effective in reducing the rate of corrosion in the upper regions of the drywell. The corrective actions also have been effective in arresting corrosion of the drywell shell in the sand bed region. Analysis performed following 2004 UT inspections show that the drywell shell will not corrode to less than minimum required thickness before the year 2029. Continued implementation of corrective actions described above and as described in "ASME Section XI, Subsection IWE" program, "Protective Coating Monitoring and Maintenance Program" (Ref. 5.3, Appendix B), and in the "Drywell Corrosion" time-limited aging analyses (Ref. 5.3, Section 4.0), will provide reasonable assurance that loss of material of the drywell shell will be detected before a loss of the containment drywell intended function.

5. References:

5.1 Oyster Creek Generating Station Updated Final Safety Analysis Report, Section 3.8.2.8, Revision 13.

5.2 NUREG-1382, Safety Evaluation Report related to the full-term operating license for Oyster Creek Nuclear Generation Station, Docket No. 50-219, dated January 1991.

5.3 Oyster Creek Generating Station License Renewal Application, July 2005.

5.4 NRC Information Notice No. 86-99, Supplement 1: Degradation of Steel Containment.