

NUCLEAR ENVIRONMENTAL ENGINEERING SECTION
2008-2009 FACT SHEET
ANNUAL UPDATE EXECUTIVE SUMMARY

For 2008, the New Jersey Department of Environmental Protection's Bureau of Nuclear Engineering (BNE) maintained and operated an independent Environmental Surveillance and Monitoring Program (ESMP) for the environs of the Oyster Creek and Salem/Hope Creek Nuclear Generating Stations. This activity was performed in accordance with the legislative authority of the New Jersey Radiation Accident Response Act (N.J.S.A.

26:2D-43.g.). Funding for these activities is provided through annual assessments against each owner of a nuclear facility located in New Jersey. By developing and implementing a comprehensive monitoring strategy, the BNE ensures that New Jersey citizens are aware of and if necessary, protected from harmful exposure to radioactive effluent discharges from New Jersey's nuclear power plants during normal or accident operations.

The specific objectives of the ESMP are to monitor pathways for entry of radioactivity into the environment in order to identify potential exposures to the population from routine and accidental releases of radioactive effluent, and to provide a summary and interpretation of this information to members of the public and government agencies. The ESMP is divided into: (1) the Radiological Environmental Monitoring Program (REMP); (2) the Thermoluminescent Dosimetry Program (TLD)¹; and (3) the Continuous Radiological Environmental Surveillance Telemetry (CREST). The REMP consists of air and potable (drinking) water samples collected by BNE staff. Other media (aquatic sediment, milk, fish/shellfish, surface water and vegetation) are collected by each nuclear power plant owner and split with the BNE for analysis. The BNE's contract laboratories, Eberline Services and Teledyne Brown Engineering analyze all REMP samples. The BNE also operates an independent program to assess direct gamma radiation levels by deploying, collecting and analyzing TLD badges. Results obtained through the REMP and the TLD programs were compared to background readings, historical results, and to U.S. Nuclear Regulatory Commission (NRC) regulatory limits. Any readings above background are investigated by the BNE through historical data comparisons and confirmation of these results with the contract laboratory. Data tables containing results of all REMP and TLD analyses can be found in the appendices of this report. The BNE CREST program is a real-time remote network of radiation detectors that monitors ambient radiation levels in the environment around the nuclear generating stations in New Jersey. They are located from just beyond the fence line of the plant to more than eight miles away.

This report contains information on the environmental sampling conducted during the time period of January 1, 2008 through December 31, 2008. During 2008, the scope of the ESMP included the deployment, collection and analysis of 535 TLD badges and the collection and analysis of 850 REMP samples. Overall, the data collected by the BNE's ESMP throughout 2008 indicate that residents living in the area around Oyster Creek and Salem/Hope Creek nuclear power plants have not received measurable exposures of radiation above normal background.

¹ A Thermoluminescent Dosimeter is a small device used to measure direct radiation by measuring the amount of visible light emitted from a crystal in the detector when exposed to ionizing radiation.

In 2008, the Bureau initiated a number of improvements to its Environmental Surveillance and Monitoring Program.

For the collection and analysis of TLD's these improvements included:

- Completion of revisions to standard operating procedures in response to comments received from an internal Department Technical Systems Audit of the BNE's TLD Program.
- Generation of element correction factors (ECFs) for over 500 TLD badges during the months of August and December 2008. This represents the entire population of BNE TLD badges available for deployment in the field. The application of ECF's compensates for the slight variations in readings between individual badges, thus normalizing TLD performance.
- Completion of a one week, onsite TLD training course conducted by Mr. Bruce Dacey of Dosimetry Resources, International, Inc.
- Annual calibration of the TLD reader in May of 2008.
- Initiation of a cross training program in January 2008 to train all BNE environmental staff in (1) annealing and analyzing TLD badges; (2) generating reports using the Doctor's Dosimetry software; (3) cleaning the TLD reader; and (4) generating element correction factors.

Throughout 2008, the BNE continued to operate a comparison study whereby TLD badges obtained from an independent laboratory, are co-located with BNE TLD badges at specific locations. A comparison study provides a way for the BNE to compare its own results against those of the independent laboratory for precision and accuracy. The BNE currently uses Global Dosimetry Solutions for the independent laboratory. In 2009, the BNE plans to add more co-located TLD badges to the comparison study at each nuclear plant site.

There were a number of improvements and accomplishments to the REMP in 2008. The deployment and collection of air charcoal samples was initiated for the Finninger Farm air sampling location (OC06) in April of 2008. Historically, the BNE only obtained air particulate filter samples from this location. Finninger Farm air samples are collected weekly by Oyster Creek's contractor, Normandeau Associates (Normandeau), and sent to the BNE for analysis. In addition, a Sample Collection and Processing database was completed in the fall of 2008. The database tracks sample receipt and analysis times and provides historical documentation of any sampling anomalies, such as low air sample volume or insufficient sample size. The database allows staff to generate electronic chain of custody forms that are sent in portable document format (PDF) to the Bureau's contract laboratories for use in sample processing.

Another improvement to the REMP program in 2008 was the initiation of the direct mailing of various split samples (vegetation, surface water, aquatic sediment, fish/shellfish) collected from the environs of the Oyster Creek plant site to the BNE's contract laboratories for analysis. Direct mailing of these samples by Normandeau, from the Oyster Creek site, reduces the laboratory sample receipt time, thereby reducing radioactive sample decay.

Finally, the DEP has contracted with Envitech Ltd to provide a new central computer for the Air Pollution/ Radiation Data Acquisition and Early Warning System, located at the DEP headquarters in Trenton, New Jersey. CREST uses this system to acquire minute by minute radiation data from a network of highly sensitive radiation detectors that surround New Jersey's four nuclear power plants. The contract with Envitech Ltd also includes upgrading data transmission from each of the thirty-two monitoring stations from leased telephone lines to wireless transmission. Presently, two locations, one in the environs of each nuclear plant site, are being tested using this wireless data transmission capability.

The data collected by the BNE's ESMP throughout 2008 does not indicate any discharges to the environment above the NRC regulatory requirements. There also is no upward trend of radioactivity for those radionuclides associated with the commercial nuclear process (such as radionuclides of cobalt, cesium, and iodine) reported during 2008. There are expected and historically noted normal fluctuations in environmental radiation data.

Bi-weekly air particulate samples were analyzed for gross beta activity and gamma emitting radionuclides. The concentrations of radionuclides measured in air were not significantly different than ambient background concentrations. These air samples were analyzed quarterly for strontium-90 (Sr-90). The analyses indicated no measurable Sr-90 concentrations in air within 10 miles of either Oyster Creek or Salem/Hope Creek.

Surface water samples were taken monthly and potable (drinking) well water samples were taken quarterly. All water samples were analyzed for gamma emitting radionuclides and tritium. No fission or activation products that emit gamma radiation (radionuclides of cobalt, iodine or cesium) were found in any sample analyzed. In addition, no tritium was found in either potable well water or surface water samples in the environs of either nuclear plant.

Fish (striped bass, bluefish, catfish, and flounder) and shellfish (crabs) were sampled at locations surrounding the Salem/Hope Creek facility. Hardshell clams and fish (striped bass, bluefish, tautog and sea trout) were sampled around Oyster Creek. Actual sample collection was done by the nuclear power plant operator. Clams and fish from Oyster Creek, fish from Salem/Hope Creek and hard-shell crabs from Salem/Hope Creek were split and analyzed by the BNE. These samples were collected semi-annually and analyzed for gamma emitting radionuclides and Sr-90. No Sr-90, fission, or activation products were found in any sample.

Routine vegetation samples (cabbages, collards, kale, mustard greens, peppers, tomato and corn) were taken from onsite gardens and local farms in the vicinity of each nuclear plant during the harvest season and analyzed for gamma emitting radionuclides. All vegetation samples were split with the BNE. No fission or activation products were found in these samples.

Monthly milk samples were taken only in the vicinity of Salem/Hope Creek and from the BNE's control location outside of Trenton, New Jersey. Since there are no dairy farms within a 10-mile radius of Oyster Creek, no samples were taken. Samples were analyzed for gamma emitting radionuclides, Sr-89 and Sr-90. Strontium-90, ranging from no activity to 2.23 ± 0.87 pCi/L, was detected at dairy farms in the vicinity of the Salem/Hope Creek nuclear power plant, as well as at the background farm location in Trenton. Activity was consistent with the U.S. Environmental

Protection Agency's (EPA) regional average of 2.14 pCi/L and well below both the EPA's national average of 9.3 pCi/L and the EPA's acceptable risk level of 1 in 10,000 or 780 pCi/L. About 99.9% of strontium in the environment comes from fallout from atmospheric nuclear weapons testing conducted in the 1950's-1960's².

Direct gamma radiation measurements were performed quarterly using TLD badges. TLD results ranged from 8.52 to 19.22 milliRoentgens per standard quarter (mR/Std. Qtr.)³ for the surrounding areas of Oyster Creek and Salem/Hope Creek. These results are consistent with those observed in previous years and are considered normal background levels for those areas of New Jersey.

CREST provides monthly average gamma radiation levels based on one- minute average radiation readings. Monthly CREST results in the environment around Oyster Creek and Salem/Hope Creek indicated average ambient radiation levels in the range of normal background (0.005 to 0.009) milliRoentgens per hour (mR/hr).

² NRC Backgrounder: "Radiation Protection and the Tooth Fairy Issue"

³ A Roentgen (R) is a unit of measurement for ionizing radiation (such as X-ray and gamma rays). A milliRoentgen (mR) is one-thousandth of a Roentgen