

State Nuclear Safety Inspector Office

March 2009 Monthly Report to the Legislature

Introduction

As part of the Department of Health and Human Services' responsibility under Title 22, Maine Revised Statutes Annotated (MRSA) §666 (2), as enacted under Public Law, Chapter 539 in the second regular session of the 123rd Legislature, the foregoing is the ninth monthly report from the State Nuclear Safety Inspector under this new legislation.

The State Inspector's individual activities for the past month are highlighted under certain broad categories, as illustrated below. Since some activities are periodic and on-going, there may be some months when very little will be reported under that category. It is recommended for reviewers to examine previous reports to ensure connectivity with the information presented as it would be cumbersome to continuously repeat prior information in every report.

Since the footnotes are expanded definitions of some scientific terms, for simplicity they were placed in a glossary at the end of the report. In addition, to better understand some of the content of the topics, some effort was placed in providing some historical information. However, for the time being this historical context will be provided as an addendum to the report.

Independent Spent Fuel Storage Installation (ISFSI)

During March the general status of the ISFSI was normal, except for the snowstorm on March 2nd. In anticipation of the snowstorm additional measures were put in place and were terminated once the storm passed. There were 13 instances of spurious alarms due to environmental conditions. All alarms were investigated and no further actions were warranted. There were no fire or security related impairments.

Three security events were logged in March. The first was related to the environmental conditions of the March 2nd snowstorm. As part of its operational constraints after a snow event the vent screens for the concrete casks need to be inspected daily for blockage. The venting is necessary to ensure that the cooling of the cask internals is maintained. The second event logged addressed incomplete testing of security alarms. The final security event logged (SEL) was written for a personnel error which resulted in tripping an Uninterruptible Power Supply (UPS) associated with the security system.

There were four condition reports¹ (CRs) for the month of March. The first one occurred on March 2nd on the damage to the Maine Yankee Pick up truck from the loading of barrels into the truck bed. A second and third CR was written on March 2nd. The first addressed the incomplete testing of a security system, and the second for recording several items in a single Security Event Log rather than one SEL for each event. A fourth CR was initiated on March 24th on an Uninterruptible Power Supply (UPS) System issue. Due to personnel error, the UPS was inadvertently turned off.

¹ Refer to the Glossary on page 5

On March 4th the State Inspector and the Manager of the State's Radiation Control Program participated in the Federal Energy Regulatory Commission (FERC) rate case settlement briefings relevant to Maine Yankee, Connecticut Yankee and Yankee Rowe. The quarterly briefing provided updates on the status of lawsuits and national and regional efforts on nuclear waste topics to both state and private officials in the states affected by the FERC settlements.

On March 12th Maine Yankee submitted to the U.S. Nuclear Regulatory Commission (NRC) its Annual Radiological Environmental Operating and Radioactive Release Effluent Release Reports. The Environmental Operating Report summarizes the direct radiation results of nine thermoluminescent dosimeters (TLDs)² locations situated within a 288 meter (about 945 feet) ring from the center of the ISFSI. The maximum calculated dose from the ISFSI was 1.7 mrem³. This compares to an average background within the United States of about 300 mrems. Since the mud flats in Bailey Cove are the closest region used by the public and that region is further away than the highest TLD location, then the dose to a member of the public would be much lower than the calculated 1.7. The Effluent Release Report summarizes the radioactive gaseous and liquid effluents for each calendar quarter. There were no gaseous or liquid releases in 2008. In addition, the report also identifies if any radioactive waste shipments took place in 2008. There were none.

On March 16th Maine Yankee submitted to the NRC its annual Decommissioning Funding Assurance Status Report. The Site-Specific Cost Estimate until 2023 is \$123.9 million with \$110.6 million projected for long term operations of the ISFSI through 2023. The market value of the trust fund at the end of 2008 was \$90.8 million.

On March 23rd Maine Yankee submitted its 2008 Individual Monitoring Report to the Nuclear Regulatory Commission. The report provides information on the radiation doses for each individual monitored at the ISFSI for last year.

Environmental

In March the State continued its periodic air sampling at the old Bailey Farm House. On March 26th at its scheduled filter change out, it was observed that the air flow rate had decreased dramatically. Therefore, on March 27th the air sampler was further field tested. Efforts to get the sampler operational failed and the unit was shut down. In addition, the control air sampler on the roof of the Health and Environmental Testing Laboratory, which experienced similar problems, had been shut down for some time. The decision was made to bring both air samplers to the Radiation Control Offices to see what failed and what servicing was required.

Maine Yankee Decommissioning

With only the East Access Road survey near the ISFSI scheduled for further evaluation this spring, one final confirmatory report remained to be completed. At present, there are ten confirmatory reports that are essentially complete with one remaining that is currently being drafted. More documentation was compiled in March and forwarded to the State's consultant for incorporation of that information into the final draft. The final confirmatory report for the final site survey is expected to be completed in April. Due to the delay in finalizing this last report, the decommissioning summary report is expected to be completed in May.

^{2,3} Refer to the Glossary on page 6

Groundwater Monitoring Program

The review of Maine Yankee' third annual ground water report has been slow and steady given the amount of information provided. At the end of March two thirds of the information had been reviewed with the remainder expected to be completed in April with comments to follow.

On March 12th, as part of the State's quality assurance oversight under the Post Decommissioning Agreement for Groundwater Radiation Monitoring between Maine Yankee and the Department of Environmental Protection, the State Inspector provided Maine Yankee with sampling containers for the seven groundwater wells that needed to be sampled in March and analyzed by the State. On March 25th Maine Yankee notified the State that the seven ground water samples were ready to be analyzed. On March 26th the State Inspector picked up the seven ground water samples and delivered the samples to the Health Environmental Testing Laboratory for analysis. The results of the analyses will be available for May's report.

Other Newsworthy Items

1. On March 5th Energy Secretary Chu told the Senate Energy and Natural Resources Committee that he plans to carry out the President Obama's wishes to find an alternative to the Yucca Mountain repository in Nevada. On the same day Idaho's Congressional delegation signed and forwarded a letter to Dr. Chu questioning the Obama Administration's plans to scale back the Yucca Mountain Project when the Department of Energy is under a 1995 court settlement to remove the high level nuclear waste from the state by 2035.
2. On March 9th Senate Majority Leader Harry Reid stated he was working to form a blue-ribbon panel to study and come up with alternatives to the proposed Yucca Mountain repository. Energy Secretary Chu has endorsed the idea of forming a commission to evaluate the nation's nuclear waste management practices.
3. On March 11th Energy Secretary Chu revealed to the Senate budget Committee that he will convene a blue-ribbon panel of experts to develop a long term strategy for waste disposal and to report back to him by the end of this year.
4. On March 11th the State Inspector and the Manager of the State's Radiation Control Program participated in the periodic status briefings of the Nuclear Waste Strategy Coalition (NWSC). The major topics on the agenda were the FY 2009 and FY 2010 appropriations before Congress and Energy Secretary Chu's comments at the Senate Energy and Commerce Committee hearing. NWSC is an ad hoc group of state utility regulators, state attorneys general, electric utilities and associate members representing 47 stakeholders in 31 states, committed to reforming and adequately funding the U.S. civilian high-level nuclear waste transportation, storage, and disposal program.
5. On March 12th Senators Harry Reid and John Ensign from Nevada introduced legislation that would create a nine-member expert panel to overhaul US nuclear waste policy. The bill would require appointees to have "national recognition and significant depth" in engineering, used nuclear fuel management, energy, government service, environmental policy, law, public administration or foreign affairs. DOE contractors, federal, state or local officials would not be considered. The blue-ribbon commission would have two years to plot a direction for managing the country's high level nuclear waste, while excluding Yucca Mountain as an option.

6. On March 12th President Obama signed the FY2009 Omnibus Appropriation Act that made a mid-year 25%, \$100 million cut in the funding for the Yucca Mountain Project.
7. On March 12th Senators Bingaman and Murkowski co-authored a letter to the Senate Energy and Natural Resources Committee stating that the US Government could be liable for \$30 billion or more in damages if the Yucca Mountain Project is abandoned. The Senators reminded the Committee members that federal courts have already found the government in partial breach of contracts with electric utilities costing taxpayers hundreds of million of dollars. Senator Jeff Bingaman is the Democratic Chairman of the Committee and Senator Lisa Murkowski is the leading Republican on the Committee.
8. On March 13th the US Nuclear Regulatory Commission (NRC) published in the Federal Register its final regulatory requirements for a high-level nuclear waste repository at Yucca Mountain, Nevada, bringing the agency's rule in line with the radiation dose standards the US Environmental Protection Agency issued last year. The NRC rule will go into effect April 13th.
9. On March 18th the NRC's Chairman, Dale Klein, stated at a Senate hearing that the NRC is revising its estimates as to how long nuclear waste can be stored at nuclear facilities. The agency could decide this summer that spent nuclear fuel could be stored securely in above-ground concrete and steel casks for at least 120 years. This is 20 years longer than the current policy that was adopted by the NRC on October 9, 2008. Previous to that storage at facilities ranged from 20 to 40 years based on the anticipated availability of the geologic repository at Yucca Mountain in Nevada.
10. On March 25th the State Inspector and the Manager of the State's Radiation Control Program participated in the bi-weekly, periodic status briefings of the Nuclear Waste Strategy Coalition (NWSC). The major topics on the agenda were the FY 2009 Omnibus Bill and FY 2010 appropriations and the Nuclear Regulatory Commission's license application hearings scheduled to start the following week in Las Vegas.
11. On March 27th Senator Reid agreed to table a bill he introduced earlier this month and let the Obama Administration's Energy Secretary Chu organize a blue ribbon commission to study nuclear waste.
12. On March 31st judges from three boards from the Nuclear Regulatory Commission's Atomic and Safety Licensing Panel started a three day hearing to listen to arguments on the Department of Energy's license application to construct a repository at Yucca Mountain. The board hearings will assess the legal standings of the 12 petitioners who filed 316 contentions on the license application. The hearings were web-streamed on the Internet.

Glossary

Condition Report (CR): A report that promptly alerts management to potential conditions that may be adverse to quality or safety. The report is generally initiated by a worker at the ISFSI facility. The report prompts management to activate a process to identify causal factors and document corrective and preventative measures stemming from the initial report.

Decay Series: There are three naturally occurring decay series of heavy elements that transform into a series of various radioactive elements by releasing energy in the form of particles, (such as alpha or beta), and/or gamma rays to end in a stable form of non-radioactive Lead. All three decay series start with extremely long lived radioactive, heavy elements that can be measured in geologic time units. They are Uranium-238 with an approximate half-life of 4.5 billion years, Uranium -235 with a half-life of about 700 million years, and Thorium-232 with a half-life of 14 billion years. All three series contain some more well-known radioactive species, Radium and Radon.

Dose is the amount of radiation that is absorbed by a person's body. In the radiation field the term dose is sometimes used interchangeably with dose equivalent, which is defined as the rem and described below.

fCi/m³ is an acronym for a femto-curie per cubic meter, which is a concentration unit that defines how much radioactivity is present in a particular air volume, such as a cubic meter. A curie, named after its discoverers Pierre and Marie Curie, is defined as the rate at which a radioactive element transforms itself into another element that is most often another radioactive element. It is mathematically equivalent to 37 billion disintegrations or transformations per second. A "femto" is a scientific prefix for an exponential term that is equivalent to one quadrillionth (1/1,000,000,000,000,000).

Gamma Spectroscopy is a scientific method used to analyze gamma rays emanating from radioactive elements. The analytical system determines the gamma ray energy which acts as a "fingerprint" for specific radioactive materials. For example, Potassium-40 (K-40) has a very, distinctive gamma energy at 1460 keV. This uniqueness allows the instrument to positively identify the K-40 1460 energy as its own unique fingerprint. A keV is an abbreviation for kilo electron volt, which is a measure of energy at the atomic level. A kilo is a scientific prefix for the multiplier 1,000.

Gross Beta is a simple screening technique employed to measure the total number of beta particles emanating from a potentially radioactive sample, with higher values usually indicating that the sample contains natural and/or man-made radioactive elements. High values would prompt further analyses to identify the radioactive species. A beta is a negatively charged particle that is emitted from the nucleus of an atom with a mass equal to that of an orbiting electron.

Liquid Scintillation is an analytical technique by which Tritium and many other radioactive contaminants in water are measured. A sample is placed in a special glass vial that already contains a special scintillation cocktail. The vial is sealed and the container vigorously shaken to create a homogeneous mix. When the tritium transforms or decays it emits a very low energy beta particle. The beta interacts with the scintillating medium and produces a light pulse that is counted by the instrument. Although a different scintillation cocktail is used, this is basically how radon in well water is measured.

pCi/kg is an acronym for a pico-curie per kilogram, which is a concentration unit that defines how much radioactivity is present in a unit mass, such as a kilogram. A "pico" is a scientific prefix for an exponential term that is equivalent to one trillionth (1/1,000,000,000,000).

pCi/L is an acronym for a pico-curie per liter, which is a concentration unit that defines how much radioactivity is present in a unit volume, such as a liter.

Rem is an acronym for roentgen equivalent man. It is a conventional unit of dose equivalent that is based on how much of the radiation energy is absorbed by the body multiplied by a quality factor, which is a measure of the relative hazard of energy transfer by different particles, (alpha, beta, neutrons, protons, etc.), gamma rays or x-rays. In comparison the average natural background radiation dose equivalent to the United States population is estimated to be 292 millirems per year, or 0.8 millirem per day, with 68 % of that dose coming from radon. A millirem is one thousandth, (1/1000), of a rem.

Roentgen is a special unit of exposure named after the discoverer of X-Rays, Wilhelm Roentgen. It is a measure of how much ionization is produced in the air when it is bombarded with X-Rays or Gamma Rays. Ionization is described as the removal of an orbital electron from an atom. A milliRoentgen is one thousandth (1/1000) of a Roentgen.

Thermoluminescent Dosimeters (TLD) are very small plastic-like phosphors or crystals that are placed in a small plastic cage and mounted on trees, posts, etc. to absorb any radiation that impinges on the material. Special readers are then used to heat the plastic to release the energy that was stored when the radiation was absorbed by the plastic. The energy released is in the form of invisible light and that light is counted by the TLD reader. The intensity of the light emitted from the crystals is directly proportional to the amount of radiation that the TLD phosphor was exposed to.

Tritium (Hydrogen-3 or H-3) is a special name given to the radioactive form of Hydrogen usually found in nature. All radioactive elements are represented as a combination of their chemical symbol and their mass number. Therefore, Tritium, which is a heavy form of the Hydrogen molecule with one proton and two neutrons in the nucleus of its atom, is abbreviated and represented by its chemical symbol, H, for Hydrogen and 3 for the number of particles in its nucleus, or mass number. Similarly, other radioactive elements, such as Potassium-40, can be represented and abbreviated as K-40, and so on.

Addendum

Historical Perspective

Independent Spent Fuel Storage Installation (ISFSI)

In 1998 the Department of Energy (DOE) was required to take title and possession of the nation's spent nuclear fuel as mandated by the Nuclear Waste Policy Act (NWPA) of 1982. When the NWPA was enacted, Congress assumed that a national repository would be available for the disposal of the spent fuel. Since the licensing and construction of the high level waste repository at Yucca Mountain in Nevada has experienced significant delays, DOE is currently projecting that the Yucca Mountain site will not be available until at least the year 2020 or later.

DOE's inaction prompted Maine Yankee to construct an ISFSI during decommissioning to store the more than 1434 spent fuel assemblies that were previously housed in the spent fuel pool in the plant, into 60 storage casks on-site. Another four casks contain some of the more radioactive components of the reactor internals that were cut up during decommissioning, since their radioactive concentrations were too high to dispose at a low level radioactive waste facility. These are expected to be shipped along with the spent fuel to the Yucca site should the repository open.

Environmental

Since 1970 the State has maintained an independent, radiological environmental monitoring program of the environs around Maine Yankee. Over the years there was an extensive quarterly sampling and analysis program that included such media as salt and fresh water, milk, crabs, lobsters, fish, fruits, vegetables, and air. Since the decommissioning the State's program has been reduced twice to accommodate decreased revenues for sample analyses at the State's Health and Environmental Testing Laboratory (HETL). Presently, the State monitors one freshwater location, one saltwater and seaweed location, and one air sample location. The State maintains a quarterly sampling regimen, except for the air sample, which is performed bi-weekly near the old Bailey Farm House. Besides the media sampling, over the years the State has maintained a robust thermoluminescent dosimeter (TLD) program to measure the radiation environment. The TLDs were placed within a 10 to 20 mile radius of the plant to measure the background radiation levels and later, when the plant was operating, any potential increases in background levels due to plant operations. Over time the number of TLDs nearly doubled to address public concerns over the clam flats in Bailey Cove and the construction of the ISFSI. After the plant's decommissioning the State reduced the number of TLDs around Bailey Cove, but maintained the same number for the environmental surveillance of the ISFSI. A further evaluation of reducing the State's radiological environmental monitoring program is planned for the fall of 2009.

Maine Yankee Decommissioning

Maine Yankee's decommissioning was completed in the fall of 2005. At that time the State Nuclear Safety Inspector (SNSI) also commenced his final walk down survey of the site. Certain areas such as the transportation routes exiting the plant site were surveyed after the plant industrial area was decommissioned. Due to the length of the egress routes, it took a considerable amount of time to complete both half-mile east and west access routes and the two thirds of a mile of the railroad track. In addition, seven specific areas, including the dirt road, were also examined as part of the final site survey. The State's final survey of the

dirt road leading to the old softball field was extended in the fall of 2007 when the State discovered three localized elevated areas on the road that were contaminated. At that time, extensive bounding samples were taken to determine the extent of the contamination.

Because of the State's findings the original Class III designation of little or no potential for small areas of elevated activity was deemed incorrect. Therefore, the Dirt Road systematic sampling was necessary to ensure that all the State's findings would still pass Maine Yankee's License Termination Plan (LTP) Class I criteria. In September's report the results of Maine Yankee's 18 Dirt Road soil samples identified one sample with man-made Cesium-137, with the remaining radioactivity from natural radioactive elements normally found in soil and bedrock, namely Uranium and Thorium and their respective decay series, and Potassium-40. On October 16th the State met with Maine Yankee to discuss their findings. The State's analyses reported that six of their 18 soil samples contained the radioactive element Cesium-137 with the remainder from the same natural decay series and Potassium-40 that was found in the Maine Yankee samples. In both cases the findings indicated that the concentration of the Cesium-137 was low and comparable to what is normally found in nature from past weapons testing during the 1950's and 1960's. On October 31st the State issued a letter to Maine Yankee stating that, based on the recent systematic sampling and bounding efforts on the elevated areas, the results demonstrated that Maine Yankee had met its Class I LTP criteria. Therefore, the State concluded that there were no further outstanding issues relative to the Dirt Road and considered the issue closed. Even though some residual radioactivity remains, due to the localized nature of the contaminant and the restricted security access to the site, the contamination found does not present a public health hazard.

With the closure of the Dirt Road, the only remaining walk down survey left to be performed on-site is the portion of the East Access Road adjacent to the ISFSI bermed area. This area remains as the background radiation levels from the ISFSI were initially too high to survey, (greater than 30,000 counts per minute), and could mask potential elevated areas. Since then the State has been monitoring the levels every spring and has observed a steady decrease in the ambient radiation levels down to 25,000 counts per minute (cpm). When the levels reach about 20,000 cpm the area will be surveyed to close out all transportation routes at the Maine Yankee site.

The State will publish its decommissioning findings in a confirmatory summary that is expected in May of 2009. As part of that process the State will condense over 40 major survey areas into eleven confirmatory reports that are being worked on by an outside consultant. The independent consultant has been collecting all the State's findings and summarizing them in confirmatory reports that the State Nuclear Safety Inspector will use to complete the State's confirmatory summary.

Groundwater Monitoring Program

In June of 2004, the State, through the Department of Environmental Protection's (DEP) authority under 38 MRSA §1455, signed an agreement with Maine Yankee for a five year, post decommissioning radiological groundwater monitoring program at the site. Presently, the program is starting its fourth year. The details of how the agreement would be carried out relative to the quality assurance facets of the monitoring, sampling and analyses would be captured in Maine Yankee's Radiological Groundwater Monitoring Work Plan.

The normal sampling regimen for the groundwater monitoring program is March, June and September of each year. However, since the first sampling took place in September of 2005, the annual sampling constitutes the September sampling of the current calendar year and finishes with the June sampling of the following year.

It should be noted that the Agreement between the State and Maine Yankee set an administrative limit of 2 mrems per year per well as a demonstration that it has met the State's groundwater decommissioning standards of a 4 mrem dose per year above background values. If a well exceeds the 2 mrem value after the five year monitoring program ends, Maine Yankee would allow the State to continue monitoring that well. To-date fifteen of the sixteen wells sampled have not exceeded one tenth of the limit, or 0.2 mrems/yr. Only well number MW-502 has come close to exceeding the 2 mrems administrative limit and that was back in March of 2006 when the dose was 1.96 mrems. Since then the Tritium in this well has been steadily decreasing. It is expected that this well will remain elevated for some time as the water infiltration rates are very low. Consequently, the decrease will be slow and steady.