

State Nuclear Safety Inspector Office

December 2008 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 sixth 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 December the general status of the ISFSI was normal, except for the snowstorm on December 21st and high winds on December 25th. In anticipation of the December 21st snowstorm additional measures were put in place and were terminated once the storm passed. There were three instances of spurious alarms due to environmental conditions. All three alarms were investigated and no further actions were warranted. There were no fire or security related impairments.

Seven security events were logged in December. All seven were related to environmental conditions. One example of the events had to do with the zone between the outside and inside fences of the protected area, which took two hours to clear. Two other events were related to the snowstorm on December 21st.

There were five condition reports¹ (CRs) generated in December. The first one occurred on December 4th had to do with a Supervisor initialing rather than signing a form. The second involved problems with the telephone system. The third one concerned radiation protection instruments being out of calibration. It should be noted that there were newly calibrated instruments on-site. However, they were not placed in their assigned locations and, therefore, no credit could be taken for their calibrations. The fourth CR was related to the high winds experienced on December 25th that dislodged the sand tent causing it to blow over. Finally, the fifth CR had to do with damage to the tractor cab light while moving downed tree limbs.

On December 6th, as a precautionary measure, the Wiscasset police department was notified that shots were fired south of the owner controlled area and it involved duck hunters in Bailey Cove.

Footnote 1: Refer to the Glossary on page 4.

Environmental

In addition to its on-going air sampling at the old Bailey Farm House, on December 28th the State performed its quarterly sampling regimen of freshwater, saltwater, and seaweed. The sampling findings will be published in a future report when results become available from the State's Health and Environmental Testing Laboratory (HETL).

Maine Yankee Decommissioning

With only the East Access Road survey near the ISFSI scheduled for further evaluation this spring, the focus of the decommissioning efforts was to complete the remaining four of the twelve confirmatory reports so that the State can publish its findings in a confirmatory summary that is expected to be completed in March of 2009. One of the four remaining draft confirmatory report was reviewed and comments were forwarded to the State's consultant for revision of the report. Currently, there are nine confirmatory reports that are essentially complete, two are in draft form awaiting reviews and one is outstanding and has yet to be drafted. To expedite the latter several documents covering survey scans, sample results, survey instrument performance checks and calibrations were forwarded to the State's consultant to commence drafting the final walk down confirmatory survey of the site.

Groundwater Monitoring Program

As part of its annual quality assurance oversight of the groundwater monitoring program, the State received seven well samples for analysis from the September groundwater sampling. The water samples were analyzed by the State's HETL and the results received in December. All seven wells had positive indications of Tritium², ranging from 153 to 39,600 pCi/L³. However, six of the seven positive indications were less than 600 pCi/L. Any well sample that has a Tritium concentration of less than or equal to 600 pCi/L is considered to be at natural background levels. The highest Tritium well is projected to give an annual radiation dose of 1.194 mrem above naturally occurring concentrations. The Tritium in this well has been steadily decreasing since its peak value in March of 2006. 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.

It should be noted that the Agreement between the State and Maine Yankee set an administrative limit of 2 mrem 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 mrem/yr. Only well number MW-502 has come close to exceeding the 2 mrem administrative limit and that was back in March of 2006 when the dose was 1.96 mrem.

Maine Yankee's third annual groundwater monitoring report was received by the Department of Environmental Protection in late December.

Other Newsworthy Items

1. On December 1st Maine Yankee transferred ownership of the Montsweag Dam and associated property to the Chewonki Foundation in Wiscasset.
2. On December 3rd the State Nuclear Safety Inspector and the Manager of the Radiation Control Program participated in the quarterly Federal Energy Regulatory Commission (FERC) rate case settlement briefings relevant to Yankee Atomic, Maine Yankee, and Connecticut Yankee. The briefings provide updates to both state and private officials in the states affected by the FERC settlements.

Footnotes 2 and 3: Refer to the Glossary on page 5

3. On December 4th the State of Nevada commented at the U. S. Surface Transportation Board's public hearing on its opposition to the Department of Energy's (DOE) application to construct and operate a 300 mile rail line from Caliente, Nevada to the federally designated spent fuel repository at Yucca Mountain in Nevada.
4. On December 9th the DOE submitted its report, entitled "The Report to the President and the Congress by the Secretary Of Energy on the Need for a Second Repository (DOE/RW-0595, December 2008)". The report states that the inventories for commercial and defense spent nuclear fuel (SNF) and high level waste (HLW) are projected to exceed 70,000 metric tons of heavy metal (MTHM) by the year 2010. The Nuclear Waste Policy Act of 1982, as amended (NWPAA), imposed a statutory limit of 70,000 MTHM on the Nation's first SNF and HLW geologic repository. Three alternatives to the dilemma were evaluated. The first was to raise the statutory limit of 70,000 MTHM for disposal at Yucca Mountain. Based on earlier studies the DOE believes there is enough capacity at the Yucca Mountain repository to store up to three or four times the current limit. The second was to begin as soon as possible the process of siting, designing, licensing and constructing a second repository. The likely candidates for this option would be those that were initially listed as potential candidates back in the 1980s due to their granitic deposits. Of the 17 states listed for investigation in the 1980's by the DOE, Maine was a candidate with a potential emplacement near the Sebago Lake region. Last year the Canadian government announced that granite would be a suitable medium for disposing of SNF and HLW. The third option was to defer the decision and prolong the time the SNF and HLW would be stored at commercial or government operating or decommissioned sites. The Secretary Of Energy recommended that the preferred alternative would be for legislative removal of the statutory limit of 70,000 MTHM.
5. On December 10th the DOE released another report, entitled "Report to Congress on the Demonstration of the Interim Storage of Spent Nuclear Fuel from Decommissioned Nuclear Power Reactor Sites" (DOE/RW-0596, December 2008) in response to the Consolidated Appropriations Act of 2008, which directed the DOE to develop a plan to remove spent nuclear fuel stored at decommissioned reactor sites and provide for consolidated storage. The DOE report concludes that under current legislative restraints imposed by the NWPAA of 1982, as amended, it is unable to accept any SNF or HLW without first removing those restrictions and then enacting enabling legislation to duly authorize the DOE to engage in the siting, designing, licensing and construction of an interim storage facility. Even if DOE had the authority today, assuming no delays or litigation, it would take six years, or the year 2015, before such a facility would begin operations.
6. On December 19th the State of Nevada filed its petition to intervene in the Nuclear Regulatory Commission's (NRC) licensing proceedings on Yucca Mountain. In its 1566 page petition the State of Nevada outlined 229 challenges to what it called flaws in the DOE'S Yucca Mountain license application.
7. On December 22nd Clark County in Nevada also filed its petition to intervene in the Nuclear Regulatory Commission's licensing proceedings on Yucca Mountain. It provided 15 contentions against the DOE license application before the NRC. In addition, one tribal group, the Timbisha Shoshone Yucca Mountain Oversight Program Nonprofit Corp, filed three contentions. Five other counties and one more tribal group have also filed petitions to intervene in the licensing proceedings.
8. On December 22nd the State of California submitted a 400 page document outlining its 24 contentions in its petition to intervene on the Yucca Mountain licensing proceedings.

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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.

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.

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 trillionth (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.

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 billionth (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 supposed 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 1400 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's (SNSI) also commenced his final walk down survey of the site. Certain areas such as the transportation routes exiting the plant site were surveyed later 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 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 March of 2009. As part of that process the State will condense over 40 major survey areas into a dozen 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. Hence, the third annual report of the post decommissioning groundwater monitoring program, summarizing the past year's findings, will be available later this fall or early winter.