

State Nuclear Safety Inspector Office

January 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 seventh 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 January the general status of the ISFSI was normal, except for the snowstorms on January 17th and on January 28th. In anticipation of both snowstorms additional measures were put in place and were terminated once the storms passed. There were six instances of spurious alarms due to environmental conditions. All six alarms were investigated and no further actions were warranted. There were no fire or security related impairments.

Ten security events were logged in January. All ten were related to environmental conditions, such as the January 17th and 28th snowstorms. 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.

There were three condition reports¹ (CRs) generated in January. The first one occurred on January 5th and had to do with an administrative oversight. A log sheet was reviewed and initialed by the on-shift supervisor, but the supervisor neglected to sign the form in the appropriate space. A second CR was written on January 20th for a regular bolt being used instead of a shear bolt in the auger shaft of a snow blower. A third CR was initiated on January 21st for minor damage to the skid steer during a training session. The cab door was not fully latched, and when the operator lifted the blower attachment, it caught the corner of the door, bending the door hinge pin.

On January 7th Maine Yankee submitted its revised Defueling Safety Analysis Report (DSAR) to the U.S. Nuclear Regulatory Commission. The DSAR is the principal licensing document describing the applicable equipment, structures, systems, operational constraints and practices, and accident analyses important to the Independent Spent Fuel Storage Installation in Wiscasset.

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 January 6th the State performed its quarterly field replacement of its thermoluminescent dosimeters (TLDs)² of the ISFSI and Bailey Cove. The results from the quarterly change out showed that, of the 13 TLD locations near the ISFSI, 11 did not demonstrate any appreciable values above normal background radiation levels, whereas two stations did exhibit slightly elevated levels due to their proximity to the storage casks. The control TLDs that are stored at the State's Radiation Control Program in Augusta averaged about 32 milliRoentgens³ (mR). The two elevated stations had values ranging from 33 to 35 mR, as compared to the 11 other stations that averaged about 27 mR and ranged from 23 to 31. In comparison the normal expected quarterly background radiation levels on the coast of Maine would range from 13 to 25 mR. An evaluation of last year's radiation monitoring will be presented in the State Inspector's annual report due July 1st.

For informational purposes Figure 1 at the end of the report illustrates the locations of the State's 13 TLD locations in the vicinity of the ISFSI. The State's locations are identified by letters. The two highest locations were stations G and K.

Maine Yankee Decommissioning

With only the East Access Road survey near the ISFSI scheduled for further evaluation this spring, the current focus is to complete the remaining three of the eleven 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 three remaining draft confirmatory reports was reviewed and comments were forwarded to the State's consultant for revision of the report. One of the original twelve confirmatory reports will not be drafted but rather incorporated into the confirmatory summary to ensure completion of the confirmatory summary in March. Currently, there are nine confirmatory reports that are essentially complete, one is in draft form awaiting review and one is in the process of being drafted. Additional documentation is being compiled to forward to the State's consultant to complete the draft of the final site confirmatory report.

Groundwater Monitoring Program

The Office of Nuclear Safety received its copy of Maine Yankee's third annual groundwater monitoring report in early January. To facilitate the review the appendices to the report were printed out and are incorporated in six three inch binders awaiting review. Due to the size of the report it is expected that the review will take one month.

Other Newsworthy Items

1. On January 1st the Department of Energy outlined its water needs for the Yucca Mountain Railroad. Although construction of the 333 miles of new rail would probably not begin until 2013 and take 4 to 10 years to complete, it would require about 2 billion gallons of water, most of which would be used in the first two years of construction for embankment compaction. Another 7.2 million gallons would be needed annually for operation and maintenance along the rail line.
2. On January 12th the State of Nevada commented on DOE's "Safe Routing Transportation and Emergency Response Training; Technical Assistance and Funding" on Section 180(c) of the Nuclear Waste Policy Act of 1982 as Amended. In its seven page response the State of Nevada expressed its concerns that funding for state and local safety officials should be based on their needs rather than on arbitrary amounts.

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

3. On January 13th, at the Senate confirmation hearing for the new Energy Secretary, Dr. Steven Chu, Dr. Chu was hopeful that new science has answers for nuclear waste, but offered no endorsement of the Yucca Mountain Project. Dr. Chu was confirmed by the Senate on January 20th and sworn in on January 21st.
4. On January 14th the U.S. Circuit Court of Appeals for the District of Columbia will hear six Yucca Mountain lawsuits, which were consolidated, that the State of Nevada filed against the federal government between 2000 and 2002.
5. On January 15th five Senators, Senators Snowe and Collins from Maine, Senators Kohl and Feingold from Wisconsin, Senator Feinstein from California, signed and forwarded a letter to then President-Elect Barack Obama urging him and his new Administration to give priority to the removal of spent nuclear fuel from their decommissioned reactor sites in the Administration's consideration of alternatives for the storage of spent fuel. Maine, Wisconsin, California, Michigan, Massachusetts and Connecticut are part of a consortium, called the Decommissioned Plant Coalition, which seeks the removal of spent fuel from shut-down reactors to a more centralized interim storage facility.
6. On January 16th the U.S. Nuclear Regulatory Commission (NRC) created three boards to consider the admissibility of 318 proposed contentions filed by 12 petitioners for adjudicatory hearing over the geologic repository at Yucca Mountain in Nevada. Each board will consist of three judges, two with legal expertise and one with technical expertise. These boards will consider only the standing of the petitioners and the admissibility of their contentions. The boards expect to hold oral arguments sometime this spring at the NRC's Las Vegas Hearing Facility.
7. On January 16th the Department of Energy's Office of Civilian Radioactive Waste Management released its "National Transportation Plan", (DOE/RW-0603, Revision 0), for public comment. Although actual shipments are not expected to begin before 2020, the DOE is seeking early input from State, Tribal, local officials and other stakeholders on its current strategy for waste shipments.
8. On January 21st the Eureka County in Nevada added its comments to the DOE's "Safe Routing Transportation and Emergency Response Training; Technical Assistance and Funding" on Section 180(c) of the Nuclear Waste Policy Act of 1982 as Amended. In their three page response county officials conveyed their concerns on the DOE's proposed funding formula as failing to reflect actual needs for training and preparation for spent fuel shipments.
9. On January 28th the Office of Senate Majority Leader, Senator Harry Reid from Nevada, disclosed new spending cuts of \$100 million for the unpopular Yucca Mountain project. The spending reduction was negotiated by the Senate Majority Leader into an omnibus bill expected to be filed in Congress the first week of February. The legislation would finalize spending through September 2009 for a number of federal agencies after lawmakers failed to finish that work last year. A stopgap bill expires on March 31.
10. On January 30th the Northeast High-Level Radioactive Waste Transportation Task Force, a consortium of ten northeast states in which the State of Maine is a member and represented by the State Nuclear Safety Inspector, also commented on DOE's "Safe Routing Transportation and Emergency Response Training; Technical Assistance and Funding" on Section 180(c) of the Nuclear Waste Policy Act of 1982 as Amended. The Task Force voiced similar concerns that funding should be based on individual state needs as opposed to arbitrary grants.

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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 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.

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 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 (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 March 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 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. 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.