State Nuclear Safety Inspector Office

November 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 fifth 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 November the general status of the ISFSI was normal. There were three 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 and no security events were logged.

There were three condition reports[1] (CRs) in November. Two of the CRs had to do with Security's Plan of the Day. The Plan was inadvertently e-mailed to the State Inspector twice. Even though there was no safeguards related information, the internal documents should not have been e-mailed to the State Inspector. The third CR dealt with a person not properly logging on to the Radiation Work Permit prior to entering the ISFSI yard radiation area.

An internal problem occurred with the automatic transfer switch of the site diesel generator. The switch remained functional, but indicated that there was a problem. The switch was replaced and tested during the month.

On November 21st Central Maine Power had a contracted drilling crew onsite performing some test borings for a possible expansion of their 345 kV switchyard.

Environmental

As mentioned in last month's report the Inspector received results from the Health and Environmental Testing Laboratory (HETL) for the past two quarters on the State's environmental surveillance program. For comparative purposes the results are presented in Table 1.

Footnote 1: Refer to the Glossary on page 5.

Table 1

Media Type	Positive Results	Quarterly Sampling Period July 2008	October 2008
Freshwater	Gross Beta[2]	2.25 pCi/L[3]	1.36 pCi/L
	Tritium (Hydrogen-3 or H-3)[4]	132 pCi/L	186 pCi/L
Seawater	Tritium (H-3)	BIDC*	235 pCi/L
	Potassium-40 (K-40)	275 pCi/kg[5]	142 pCi/kg
Seaweed	Beryllium-7 (Be-7)	111 pCi/kg	60.6 pCi/kg
	Potassium-40 (K-40)	4,160 pCi/kg	4,490 pCi/kg
	Iodine-131 (I-131)	52.7 pCi/kg	BIDC
Air Filters	Gross Beta (range)	14.4 – 23.4 fCi/m^3 (6)	17.5 – 23.5 fCi/m^3
	Quarterly Composite (Be-7)	94.9 fCi/m^3	82.3 fCi/m^3

* BIDC = Below Instrument's Detection Capability

The HETL employs various analytical methods to measure particular radioactive elements that are described in the Glossary.. Except for Iodine-131 (I-131), all the positive results reported highlight naturally occurring background levels and ranges. There are some seasonal variations, but these would be difficult to point out with only two data points. When additional surveillance results become available the data will be plotted to illustrate the trends.

The Iodine-131 that was found does not originate from Maine Yankee. With a half life of about 8 days, any I-131 with an inventory of one billion curies would have decayed or disappeared in about a year and a half after the plant shutdown, or about July of 1998. The source is most likely from the Wiscasset Municipal Waste Treatment System. Patients at nearby hospitals are sometimes injected with radioactive Iodine for thyroid scans or uptakes. When the patients return home and use their bathroom facilities, the waste water containing the I-131 is channeled to their local wastewater treatment plant. The treated water is then discharged into the bay and the I-131 is eventually picked up by the seaweed. Seaweed is a very efficient bio-accumulator for quite a few chemical elements and therefore, a good indicator of environmental contaminants.

Tritium (Hydrogen-3 or H-3) and Beryllium-7 (Be-7) are both naturally occurring "cosmogenic" radioactive elements, which mean they are continuously being produced by cosmic-ray interactions in the atmosphere. Be-7 is produced from the high-energy cosmic rays bombarding the oxygen, carbon and nitrogen molecules in the atmosphere. Besides being naturally produced, Tritium is also a man-made element as it is a by product of the fission and neutron activation processes in nuclear power plants.

Since Potassium-40 (K-40) has such a long half life, approximately 1.3 billion years, it is a "primordial" radioactive element, which means it has survived in detectable quantities in the earth's crust since the formation of the earth. Generally speaking K-40 is not normally found in freshwater, but it is readily detected in saltwater due to minerals being washed into streams and rivers and ultimately emptying into the ocean.

Footnotes 2 through 6: Refer to the Glossary on pages 5 and 6.

Maine Yankee Decommissioning

Since the Dirt Road issue was resolved as related in last month's report and that the East Access Road survey near the ISFSI was scheduled for further evaluation this spring, the remaining focus of the decommissioning efforts will be to complete the four remaining confirmatory reports so that the State can publish its findings in a decommissioning summary that is expected to be completed in March of 2009. To that end arrangements were made with the State's consultant to schedule activities to meet this goal.

Groundwater Monitoring Program

As part of its annual quality assurance oversight of the groundwater monitoring program, the State received seven well samples for analysis and those results will be available for the December monthly report. It is expected that Maine Yankee's September results will also be available for the December report in conjunction with their third annual groundwater monitoring report. A comparison of the State's and Maine Yankee's results will be provided in December's report.

In late October the State received Maine Yankee's June well water sample data and those results are presented below.

Table 2

Well Numbers	Tritium Results	Dose[7] Projections
MW-401C	650 pCi/L	0.00153 mrem/yr
MW-501	970 pCi/L	0.0113 mrem/yr
MW-502	39,730 pCi/L	1.198 mrem/yr
MW-503	650 pCi/L	0.00153 mrem/yr
MW-505A	550 pCi/L	0 mrem/year*
MW-506C	390 pCi/L	0 mrem/year

* Note: Any well sample, which has a Tritium concentration of less than or equal to 600 pCi/L, is presumed to be at natural background levels and therefore assigned a zero dose.

Six of the sixteen wells display slightly elevated Tritium levels, except for well number MW-502, which is 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 in this well 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/yr per well as a demonstration that it has met the State's groundwater decommissioning standards. 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.

On November 21st the State Nuclear Safety Inspector met with Department of Environmental Protection officials to discuss when hard-to-detect/transuranic (HTD/TRU) analyses could be performed in the last sampling year. The last sampling year starts with the September 2009 sampling and ends with the June 2010 sampling.

Footnote 7: Refer to the Glossary on page 5

Other Newsworthy Items

1. On October 31, 2008, the Department of Energy (DOE) published in the Federal Register a notice for safe routine transportation and emergency response training, technical assistance and funding. The DOE is publishing this notice of revised proposed policy to set forth its revised plans for implementing Section 180 (c) of the Nuclear Waste Policy Act of 1982, as amended. Although this notice is for the proposed funding allocation approach for grants to federally recognized Tribes, it is also the vehicle by which the DOE will provide technical and financial assistance for training local public health safety officials to States and Tribes through whose jurisdictions the DOE plans to transport spent nuclear fuel or high level radioactive waste.

2. On November 6, 2008, Edward Sproate, Director of DOE's Office of Civilian Radioactive Waste Management, stated at a Center for Strategic and International Studies Conference that Congress must approve a larger expansion of the Yucca Mountain facility in Nevada or begin looking for a second permanent repository. Currently, the Yucca Mountain site is limited by law to a 77,000 ton limit. According to Mr. Sproate the amount of waste produced within the next two years by the country's 104 nuclear power plants and defense waste will exceed the 77,000 limit. He also reiterated that the Yucca Mountain facility is not projected to open until 2020 at the earliest.

3. On November 18, 2008, the Decommissioned Plant Coalition (DPC) drafted a letter to President-elect Obama urging him and his new Administration to support the moving of spent nuclear fuel from decommissioned reactor sites to a centralized interim storage facility outside of New England in advance of a final disposal repository. The DPC is made up of representatives from Maine, Connecticut, Massachusetts, Wisconsin, Michigan and California. The interim storage measure has support from various organizations such as the National Commission on Energy Policy, the Keystone Center for Science and Public Policy, the New England Council, the National Association of Regulatory Utility Commissioners, the National Conference of State Legislatures, the Congressional FY-08 Consolidated Omnibus Bill Report (HR 2764-PL 110-161) to name a few.

4. On November 21, 2008, the Las Vegas Review Journal reported that Senator Harry Reid and President-elect Barack Obama have had several discussions over the Yucca Mountain Project since the election. According to the Review Journal Senator Reid sees President-elect Obama as blocking the nuclear waste repository. During the presidential campaign, Senator Obama declared that the selection of Yucca Mountain for long term waste storage had failed and advocated for nuclear waste storage at current reactor sites while policy makers come up with an alternative approach.

5. On November 26, 2008, the State of Nevada commented on the DOE'S Draft Global Nuclear Energy Partnership Programmatic Environmental Impact Statement (EIS). The State of Nevada took issue with the EIS due to its reliance on Yucca Mountain.

6. On November 26, 2008, the NRC announced that its Pre-License Application Presiding Officer (PAPO) Board will hold a public meeting on December 2, 2008, in Rockville, Maryland to discuss how classified information will be protected and handled during the adjudicatory hearings on the proposed high-level waste repository at Yucca Mountain in Nevada.

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State Nuclear Safety Inspector

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/m^3 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) of.

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) of.

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 any 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. However, there was some movement in the last Congress as it required the DOE to report back by the end of this year on the logistics of removing the spent nuclear fuel from the nation's closed plants.

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.

The Dirt Road sampling was necessary to ensure that all the State's findings would still pass Maine Yankee's License Termination Plan (LTP) Class I standards, since the original Class III designation was incorrect. 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[4], 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 October31st 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 this matter 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 decommissioning 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 decommissioning summary. Currently, there are eight confirmatory reports that are essentially complete, two are in draft form awaiting review and two are outstanding and have yet to be drafted. Since the consultant's contract expired in July, a renewal contract was written and approved in September to cover the remaining reports.

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.