

State Nuclear Safety Inspector Office

August 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 (MRS) §666 (2), as enacted under Public Law, Chapter 539 in the second regular session of the 123rd Legislature, the foregoing is the 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 August the general status of the ISFSI was normal. There were 5 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 in August. There were, however, 13 security events logged. One addressed a momentary power loss, the other a failed sensor, one involved the computer being momentarily unresponsive and all others were due to environmental conditions. In each case compensatory measures were implemented as directed by station procedures.

There were 7 condition reports¹ (CRs) for the month of August. The first CR was written on August 11th and involved a breaker that was not fully closed after testing. The partial closure was discovered during checks on the next shift. A second CR was written on August 12th over procedural adherence in routing and closure of documentation. A third CR was written on August 13th on the extension cord to the state's air monitor. The cord was found on the ground rather than being raised for safety reasons. A fourth CR was written on August 14th on the testing of fire doors not being performed in full conformance with procedural guidance. A fifth CR was generated on August 15th and addressed an improvement to the portable generator connection at the gate house. A sixth CR was generated on August 26th for a momentary loss of power during the performance of a maintenance activity and was attributed to personnel error. The seventh CR was also generated on August 26th and involved a small fuel spill to pavement when the fill cap to a weed whacker was not fully tightened after fueling.

Other ISFSI Related Activities

On August 4th the US Nuclear Regulatory Commission, Region I, provided their June 23rd security inspection report of Maine Yankee's ISFSI. There were no findings or violations.

¹ Refer to the Glossary on page 4.

On August 20th Maine Yankee submitted its annual Special Nuclear Material (SNM) Report for the period ending July 28, 2009. The report represents the material accountability for fissionable material, such as Uranium-235 and Plutonium-239 on US Government owned or non-US owned nuclear fuel between beginning and ending inventories, radioactive decay differences, if any, and receipts of or removals of SNM. The report also includes source material such as natural Uranium and Thorium.

On August 31st Maine Yankee commenced its periodic painting of the vertical concrete cask covers. The maintenance activity is expected to last a month or more.

Environmental

In addition to its periodic air sampling at the old Bailey Farm House, the results from the State's June 30th quarterly sampling regimen of freshwater, saltwater, and seaweed will be published in the September report.

Maine Yankee Decommissioning

At the end of July the last confirmatory report was completed and forwarded to the State Inspector. At present, there are eleven confirmatory reports that are essentially complete. Due to the extensive delays in finalizing this last report including on-going commitments, the decommissioning summary report is now expected to be completed in October.

Groundwater Monitoring Program

The results from Maine Yankee's June groundwater sampling should be available for review by the State and the findings published in the September report.

Other Newsworthy Items

1. On August 1st the Las Vegas Review Journal reported that Nevada's Governor Gibbons wrote a letter to Senate Majority Harry Reid requesting him to use his influence and repeal the Nuclear Waste policy Act that designates Yucca Mountain as the nation's geologic repository for spent nuclear fuel.
2. On August 4th Energy Secretary Chu wrote a letter to Senators Kennedy and Kerry from Massachusetts agreeing to include "a member with expertise in spent fuel management at decommissioned plants" to the blue ribbon panel that the Administration plans to convene for spent fuel waste management. A copy of Dr. Chu's letter and Senators Kennedy's and Kerry's letter is attached to the end of the report.
3. On August 5th the Department of Energy announced that the long awaited waste study expected to lead to final decisions on the environmental clean-up of the Hanford reservation in the State of Washington would be delayed in order to align the draft study with recent direction to re-evaluate the disposal options for high level radioactive waste and spent nuclear fuel.
4. On August 6th in the Bulletin of Atomic Scientists, Richard Garwin, a physicist and a recipient of the Presidential National Medal of Science in 2003, stated that reprocessing of spent nuclear fuel is not the answer to reducing the need for mined uranium and underground repositories, but would rather add additional cost and hazard. According to Dr. Garwin reprocessing would only be feasible when the cost of natural uranium would exceed \$750 per kilogram as compared to its current market price of \$70 per kilogram.

5. On August 11th the Nevada Board of Examiners, comprised of the Secretary of State, the Attorney General and Budget Director, approved another \$10 million to hire the Washington DC firm of Egan Fitzpatrick & Malsch to continue the State's legal battle to block the licensing of the Yucca Mountain repository. The firm has represented the State of Nevada since 2002.
6. On August 14th, according to U.S. Senator Jim Risch from Idaho, the State of Idaho is contemplating filing a lawsuit against the federal government over their decision to abandon the Yucca Mountain Project. Idaho has a long standing contract with the Department of Energy to remove the stockpile of high level radioactive waste from the Idaho National Laboratory and store it at Yucca Mountain.
7. In mid-August a group of experts in nuclear waste policy from three mid-western universities published a report from a March 16, 2009 workshop on Arms Control, Disarmament and International Security held at the University of Illinois at Urbana-Champaign. The report documents the recent success achieved in reaching a consensus on how to revise the nation's management of spent nuclear fuel. Although the report lists five Plans (A-E), the experts advocate a Plan D – holding spent fuel in dry cask storage until it becomes clearer whether reprocessing will precede permanent disposal. The experts proposed seven recommendations that would require US Congressional action to manage this situation efficiently and lay the groundwork for a useful transition to long term spent fuel management. They are: 1) set up regulated escrow accounts for utilities to draw on for on-site management of dry cask storage, 2) allow shipments of spent fuel from one utility to another utility in the same state, 3) provide a financial incentive for states to agree to accept spent fuel from an inoperative site in a neighboring state to a reactor site in their own state, 4) require any licensed reprocessing facility to be licensed for on-site storage of any spent fuel and reprocessing waste streams, 5) set up a tightly regulated corporation to license long term spent fuel facilities should the federal government fail to do so, 6) allow states to receive very large financial incentives for hosting long term spent nuclear fuel facilities, and 7) consider licensing long term management facilities for taking spent fuel from many different reactor sites, but not using such facilities until it is clear that it is more economical to do so than to store in dry casks at operating reactor sites.
8. On August 20th the Attorney General from Nevada sent a letter to the Commissioners of the U.S. Nuclear Regulatory Commission (NRC) requesting that the NRC staff's Safety Evaluation Report on the Yucca Mountain license application include a performance assessment of the "post-closure radiation standards without the titanium alloy drip shields the Department of Energy proposes to install after the wastes are emplaced" in the repository. Nevada's contention is that the assessment will demonstrate that the radiation standards established by the U.S. Environmental Protection Agency for Yucca Mountain will not be met without the drip shields.
9. On August 31st local leaders and lawmakers from the States of Washington, Idaho and South Carolina expressed their concerns that the highly radioactive waste from the building of the nation's nuclear weapons arsenal will remain in their states indefinitely as de facto nuclear dumps due to the Administration's shutdown of the Yucca Mountain Project. The States have legal binding agreements with the federal government that require the Department of Energy to take their waste to Yucca Mountain.

Other Noteworthy Items:

1. On May 19th the Council of State Governments (CSG) issued a resolution on federal policy on nuclear waste management. The resolution "urges the federal government to honor its obligations under the Nuclear Waste Policy Act (NWPA), to provide the Department of Energy and the Nuclear Regulatory Commission sufficient funding to carry out their obligations under the NWPA, including the full funding for state regional transportation projects and other state activities." A copy of the CSG resolution is attached to the end of the report.

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.

milliRoentgen (mR) is one thousandth (1/1000) of a Roentgen.

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.

Skyshine is radiation from a radioactive source that bounces off air molecules in the sky, much like a cue ball does off the banking of a billiard table, and is scattered/redirected back down to the earth.

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 Perspectives

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 had 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. Since then the Obama Administration and Energy Secretary Chu have advocated that the Yucca Mountain site is no longer a viable option for disposing of the nation's high level waste and spent nuclear fuel and plan to assemble a Blue Ribbon Panel of experts to review alternative strategies for managing these waste forms.

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. The State and Maine Yankee findings both indicated that the random 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 October 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 in 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.