

# State Nuclear Safety Inspector Office

## July 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 123<sup>rd</sup> 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 June the general status of the ISFSI was normal. There was one instance of a spurious alarm due to environmental conditions. That alarm was investigated and no further actions were warranted.

There were no new fire related impairments in July. However, there was one outstanding impairment from June 24<sup>th</sup> on the 60 boxes of records that were waiting scanning before being shredded. The fire impairment was discontinued on July 29<sup>th</sup> after all the records were disposed of.

There were 14 security events logged in July. Twelve of the fourteen SELs logged were for brief issues with camera visibility. Compensatory measures were implemented as needed. The remaining two SELs were due to environmental conditions on July 2<sup>nd</sup>. There were no security related impairments.

There were two condition reports<sup>1</sup> (CRs) for the month of July. The first CR was written on July 14<sup>th</sup> and was related to the method of testing for intrusion sensors. A more sensitive testing method was employed, but the procedure did not provide for such an option. A second Cr was also initiated on July 14<sup>th</sup> and it involved a fuel rod accounting issue that was discovered during a fuel loading records review.

#### *Other ISFSI Related Activities*

On July 2<sup>nd</sup> a work order was generated on some alarm problems. The alarm problems were resolved within several hours. The problem was related to moisture intrusion.

On July 5<sup>th</sup>, as part of the ISFSI's emergency preparedness program, the quarterly emergency plan cell phone check was completed satisfactorily.

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<sup>1</sup> Refer to the Glossary on page 5.

On July 8<sup>th</sup> the ISFSI Oversight Group met to discuss the Yucca Mountain Project and Congressional efforts to maintain its existence and the status of the potential underground power plant near the Maine Yankee site. In addition, Maine Yankee and the State Inspector provided updates of their activities to the Group.

On July 29<sup>th</sup> a suspicious vehicle was observed. An individual approached the site gate, spoke remotely with a security officer and then departed. The local law enforcement agency responded, but was not able to locate the vehicle.

## Environmental

In addition to its periodic air sampling at the old Bailey Farm House, on July 21<sup>st</sup> the State received the results from the second quarter field replacement of its thermoluminescent dosimeters (TLDs)<sup>2</sup> 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, G and K, 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 39 milliRoentgens (mR)<sup>3</sup>. The two normally elevated stations averaged 32 mR, as compared to the 11 other stations that averaged about 24 mR and ranged from 20 to 29. In comparison the normal expected quarterly background radiation levels on the coast of Maine would range from 13 to 25 mR.

The reason for the depressed radiation values for the TLDs was due to some remaining snow cover and icing conditions until mid-April. Since there is a seasonal variation to the ambient radiation environment that follows the out gassing of the Radon gas from the soils, it is normal for the values to decrease during such conditions. Since the TLD controls were housed inside the State's Offices they were not exposed to the remnants of winter, but were exposed to naturally occurring radioactive elements in the building materials.

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.

The Bailey Cove TLDs averaged 21 mR and ranged from 18 to 26 mR, which is comparable to the normally expected background radiation levels.

## 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 Department of Environmental Protection (DEP) requested the State Inspector to provide a list of recurring themes outlined in his comments to DEP on Maine Yankee's third annual groundwater monitoring report. That information is expected in August.

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<sup>2,3</sup> Refer to the Glossary on pages 5 and 6.

## Other Newsworthy Items

1. On July 2<sup>nd</sup> the Nuclear Regulatory Commission's (NRC) Atomic Safety and Licensing Board governing the license application contentions issued an order to the NRC staff to advise the Board within 10 days whether the NRC staff's entire Safety Evaluation Report (SER) will be issued by April 23, 2010 as required, or, if not, the NRC staff's best estimate of when the SER will be issued. The order was issued due to concerns about realistic expectations in light of fiscal realities.
2. On July 8<sup>th</sup> the Nuclear Energy Institute (NEI), the lobbying arm of the nuclear industry, forwarded a letter to Secretary of Energy Chu calling for the suspension of payments to the Nuclear Waste Fund. Each nuclear utility is required to pay one tenth of one cent per kilowatt-hour of electricity it produces into the Nuclear Waste Fund to develop a national geologic repository for spent nuclear fuel and high level waste, including defense related wastes. A copy of the NEI letter is attached to the end of the report.
3. On July 8<sup>th</sup> the National Association of Regulatory Utility Commissioners (NARUC) sent a letter to Secretary of Energy Chu supporting the Nuclear Energy Institute's request to discontinue payments by nuclear utilities to the Nuclear Waste Fund. NARUC expressed their position by stating that "if we are going to pause to reconsider disposal options, we feel it is also appropriate to pause the fee payments". A copy of NARUC letter is attached to the end of the report.
4. On July 8<sup>th</sup> the Nuclear Waste Strategy Coalition (NWSC) held a status briefing. The major topics of discussion focused on the House and Senate FY 2010 proposed budgets and hearings, the status of the Blue Ribbon Panel, the Department of Energy's (DOE) Yucca Mountain license application currently under review by the Nuclear Regulatory Commission and DOE's outstanding ground water supplement to its Yucca Mountain Environmental Impact Statement. The NWSC is an ad hoc group of state utility regulators, state attorneys general, electric utilities and associate members representing 47 stakeholders in 31 states, committed to reforming and adequately funding the U.S. civilian high-level nuclear waste transportation, storage, and disposal program.
5. By July 10<sup>th</sup> the Clark County Commission in Nevada approved a \$200,000 road study to support their contention that the Department of Energy did not properly assess the threat to public safety from trucking hazardous waste through the County. The Clark County is the home of Las Vegas.
6. On July 10<sup>th</sup> the Senate Committee on Energy and Natural resources was reviewing Senate Bill, S. 861, Rebating America's Deposits Act. The Act requires the President to certify Yucca Mountain as the nation's geologic repository for spent nuclear fuel and high level waste. If the President fails to certify Yucca Mountain, then utilities will cease making payments to the Nuclear Waste Fund and they will receive from the Secretary of the Treasury their pro-rated share of their payments into the Nuclear Waste Fund including interest. 75% of the monies returned will be rebated to the ratepayers with the remaining 25% used by the utilities to upgrade storage and security of their nuclear materials.
7. On July 10<sup>th</sup> the Nuclear Regulatory Commission released its 2008 annual security inspection report to Congress. The report states that the NRC conducted 182 security inspections at nuclear power plants and fuel facilities. Of the 182 inspections, 24 were force-on-force inspections with a mock adversary force to test the facility's response. The inspections identified 133 findings, 125 of which were of very low security significance with the remaining eight in the low to moderate significance. All were corrected immediately or compensatory measures put in place. Although Maine Yankee's Independent Spent Fuel Storage Installation (ISFSI) in Wiscasset was not included in this report, there were no security findings in 2008 or 2009 at the ISFSI.
8. On July 14<sup>th</sup> the Nuclear Waste Strategy Coalition sent a letter to Energy Secretary Chu requesting the immediate cessation of utility payments into the Nuclear Waste Fund. The request was based on the

Department of Energy's (DOE) appropriated Fiscal Year 2010 budget of \$98.4 million, which is less than 13% of the \$763 million paid into the Fund in 2008. The interest on the Fund amounted to \$1.117 billion, or a total annual income of \$1.88 billion for 2008. Since the Fund's establishment in 1982 by the Nuclear Waste Policy Act, the DOE has expended \$10.8 billion, leaving a balance of \$19.2 billion in the account, more than enough to offset any foreseeable expenditures.

9. On July 16<sup>th</sup> Christopher Kouts, Acting Director of the Office of Civilian Radioactive Waste Management for the Department of Energy (DOE), told the House Budget Committee that taxpayers will have to pay \$12.3 billion by 2020 for not accepting the spent fuel waste. That will be \$2 billion more than the \$10 billion the DOE has spent over the last 25 years in studying the Yucca Mountain site. As of May this year 71 lawsuits have been filed to recover damages against the federal government for breaching its contracts with utilities.
10. On July 21<sup>st</sup> Senator Lindsey Graham from South Carolina offered an amendment to the 2010 defense authorization bill calling for "consideration of Yucca Mountain" for disposing of defense related high level waste and spent nuclear fuel.
11. On July 28<sup>th</sup> the State Inspector submitted his 2008 annual report to the Legislature. A copy is available upon request.
12. On July 29<sup>th</sup> the Senate passed by a vote of 85-9 its version of a \$34.3 billion energy and water projects bill. The bill effectively cuts an additional \$27 million from the Administration's budget of \$56 million for the Nuclear Regulatory Commission's review of the Department of Energy's license application for Yucca Mountain. Earlier in the month the House passed its own \$33.3 billion version. The House bill does contain a provision that the \$5 million earmarked for the Blue Ribbon Commission must consider Yucca Mountain as part of the Commission's review. Both bills will go to a House-Senate conference committee to work out differences before a final bill can be sent to the President.
13. On July 29<sup>th</sup> the Nuclear Waste Strategy Coalition (NWSC) held another status briefing. The major topics of discussion focused on the FY 2010 proposed budget, position statements on the Blue Ribbon Panel, the Department of Energy's (DOE) Yucca Mountain license application contentions, and the June 2009 DOE Financial Summary on the Yucca Mountain Project funding and disbursements. Through May 31<sup>st</sup> the Nuclear Waste Fund balance was \$23,107,000. The NWSC is an ad hoc group of state utility regulators, state attorneys general, electric utilities and associate members representing 47 stakeholders in 31 states, committed to reforming and adequately funding the U.S. civilian high-level nuclear waste transportation, storage, and disposal program.
14. On July 30<sup>th</sup> Senate Majority Leader, Harry Reid, announced "that President Barack Obama and Energy Secretary Steven Chu have agreed to eliminate all funding for pursuing a license for the nuclear waste disposal (Yucca Mountain) project in 2011."

*Other Noteworthy Items:*

1. On June 17<sup>th</sup> the House of Representatives forwarded a letter to Energy Secretary Chu expressing their strong support for the Yucca Mountain Project and the Nuclear Regulatory Commission's licensing review of the Department of Energy's application to construct a geologic repository at Yucca Mountain. The letter was signed by 25 Representatives from 13 states. A copy of the letter is attached to the end of the report.
2. On June 29<sup>th</sup> the Department of Energy officially announced that the Global Nuclear Energy Partnership (GNEP) to build a nuclear reprocessing facility has been canceled. The GNEP was set up in 2006 to limit the proliferation of nuclear enrichment technologies by developing countries by creating a guaranteed fuel supply provided they agreed not to develop their own enrichment capabilities.

# 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/m<sup>3</sup>** 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 Perspective

### Independent Spent Fuel Storage Installation (ISFSI)

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

DOE's inaction prompted Maine Yankee to construct an ISFSI during decommissioning to store the more than 1434 spent fuel assemblies that were previously housed in the spent fuel pool in the plant, into 60 storage casks on-site. Another four casks contain some of the more radioactive components of the reactor internals that were cut up during decommissioning, since their radioactive concentrations were too high to dispose at a low level radioactive waste facility. These are expected to be shipped along with the spent fuel to the Yucca site should the repository open. 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. 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 16<sup>th</sup> 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 31<sup>st</sup> 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 June 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.