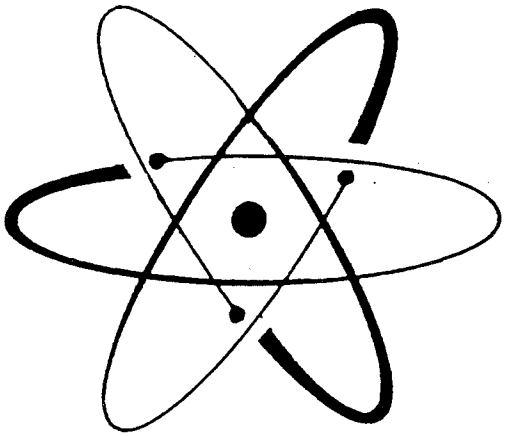
STATE OF MAINE

NUCLEAR SAFETY REPORT

submitted to the

117th Maine Legislature, 1995



prepared by

Uldis Vanags
State Nuclear Safety Advisor

ve Department **Maine State Planning Office**

STATE OF MAINE
EXECUTIVE DEPARTMENT
STATE PLANNING OFFICE

ANGUS S. KING, JR.
GOVERNOR

EVAN D. RICHERT, AICP
DIRECTOR

February 1, 1995

Members of the 117th Legislature,

I am pleased to submit to you the 1995 annual report of the State Nuclear Safety Advisor.

This report briefly discusses the operation of the Maine Yankee Nuclear Power Station with respect to the plant's performance, inspections by the U.S. Nuclear Regulatory Commission, and monitoring activities of the State Nuclear Safety Inspection program. Highlights presented for 1994 include the condition of the steam generators at Maine Yankee, the contamination of University of Southern Maine Students during a plant tour, the status of high-level and low-level radioactive waste management in Maine, and the removal of buried radioactive waste from the former Loring Air Force Base.

Issues involving Maine Yankee as an energy source and the safe management of radioactive materials in Maine continue to be of considerable interest to the people of Maine. I am sure this report and the work of the State Nuclear Safety Advisor will contribute to informed decision-making.

Sincerely,

Evan D. Richert, AICP
Director

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INTRODUCTION

This report is presented in compliance with 25 MRSA, §52 directing the State Nuclear Safety Advisor to submit an annual report on issues pertaining to the safe operation of nuclear facilities, and the safe transportation and storage of nuclear waste.

The State Nuclear Safety Advisor position was established in legislation in 1987 that created a State Nuclear Safety Inspection and Monitoring Program for Commercial Nuclear Power Facilities in the State of Maine. The statue was enacted to address the concerns of the potential impact nuclear facilities can have on public health and safety, and the environment.

The responsibility of the Nuclear Safety Advisor is to provide the Governor and Legislature with information, analyses, and recommendations on issues pertaining to the safe operation of nuclear facilities and the safe transportation and storage of nuclear waste. More specifically, the Nuclear Safety Advisor provides State oversight of policy issues affecting nuclear power generation, including spent fuel storage, low-level waste, reactor decommissioning, radiation monitoring, and public health and safety. The Nuclear Safety Advisor serves as the State liaison to nuclear facilities operating in Maine, and coordinates State agencies on nuclear power related issues.

This report summarizes the major nuclear related activities and issues for 1994, and provides an update of the operations at the Maine Yankee Atomic Power Station located in Wiscasset, State activities associated with the monitoring and assessment of Maine Yankee, and the status and management of high-level and low-level radioactive waste in Maine.

Maine Yankee's Operation and Performance

Maine Yankee, Maine's only nuclear power plant, is located at Bailey Point in the town of Wiscasset. The plant began generating electricity in December, 1972. The electric generating plant utilizes a pressurized water reactor (PWR) designed by Combustion Engineering with an upgraded electrical output of 900,000 kilowatts. Of the total electricity produced at Maine Yankee, approximately half is sold to utilities in Maine and the remainder goes to out-of-state utilities. Of the total electrical consumption in Maine, Maine Yankee is the most significant sole source, supplying slightly above 20% of Maine's electricity needs in 1993, (as well as is expected for 1994). Figure 1 depicts the annual Maine Yankee electrical contribution to total electrical sales by Maine utilities since 1973. As is evident from the graph, Maine's electrical needs increased during the 80's and leveled to a fairly constant annual demand in the early 1990's, while Maine Yankee's contribution remains relatively constant. The net electrical production for Maine Yankee in 1994 (6621 million kilowatt-hours) is second only to the plant's record production in 1989 of 6,888 million kilowatt-hours. Figure 2 displays the total net annual electrical production at Maine Yankee which includes the power sold to out-of-state utilities. The data indicate that since 1988 Maine Yankee's electrical production has shown an overall increase from earlier years. This is due in part to the efforts of Maine Yankee and the nuclear industry as a whole to improve the reliability, performance, and safety of nuclear

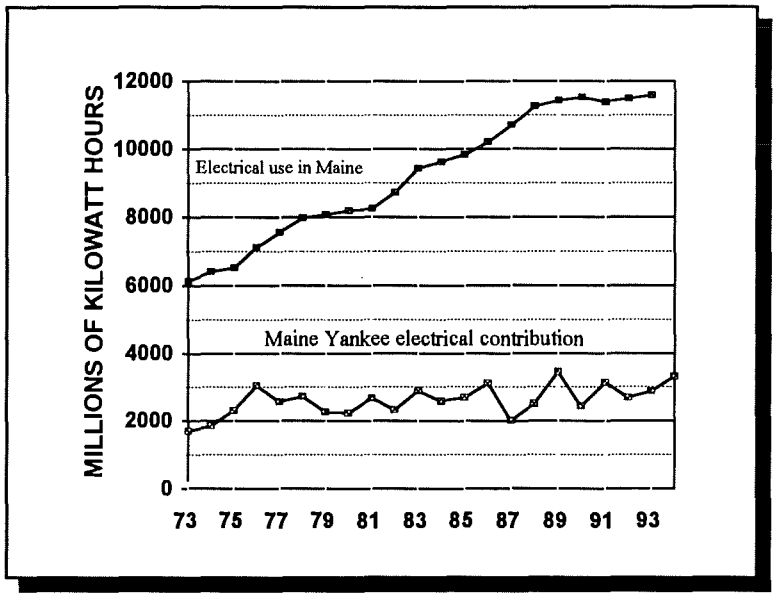

Figure 1 *Maine Yankee's electrical contribution and total electrical consumption in Maine.*

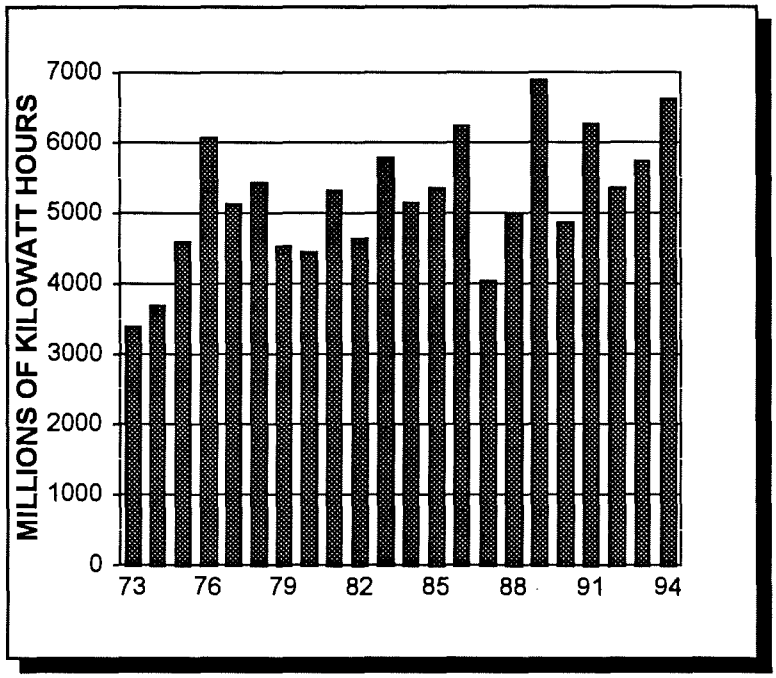

Figure 2 *Annual net electrical production for Maine Yankee.*

power plants. Overall, Maine Yankee continues to provide a fairly constant and predictable portion of Maine's energy needs.

The efficiency and reliability of Maine Yankee to produce electricity can be assessed by a measure of the plant's capacity factor (CF) and the unit availability factor (UAF). The capacity factor is the measure that describes the percent of maximum possible electricity generation by a nuclear power plant. As an example, a nuclear power plant generating all the electricity it could by design in one year would have a CF of 100 percent. In 1994, Maine Yankee operated at an annual CF of 88 percent, which is above the plant's average performance of 77 percent from 1980 to 1993. As shown in figure 3, Maine Yankee's performance in the early 80's was above the industry average but is now more closely following the improving trend occurring in the nuclear industry. Because the annual capacity factor is dependent upon whether refueling activities occurred in a particular year, a three-year average of capacity factors is more indicative of the overall trend in this performance area. Figure 4 shows Maine Yankee's three-year average CF compared with the U.S. nuclear industry annual average. The graph shows Maine Yankee's performance in this area is above the industry average, and follows the improving U.S. nuclear industry trend since the early eighties.

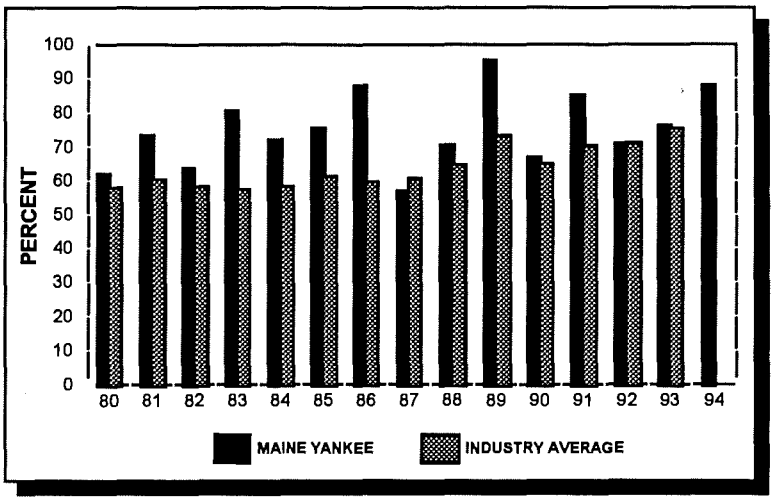

Figure 3 *Annual Maine Yankee capacity factor (MDC net) compared to the U.S. pressurized water reactor industry.*

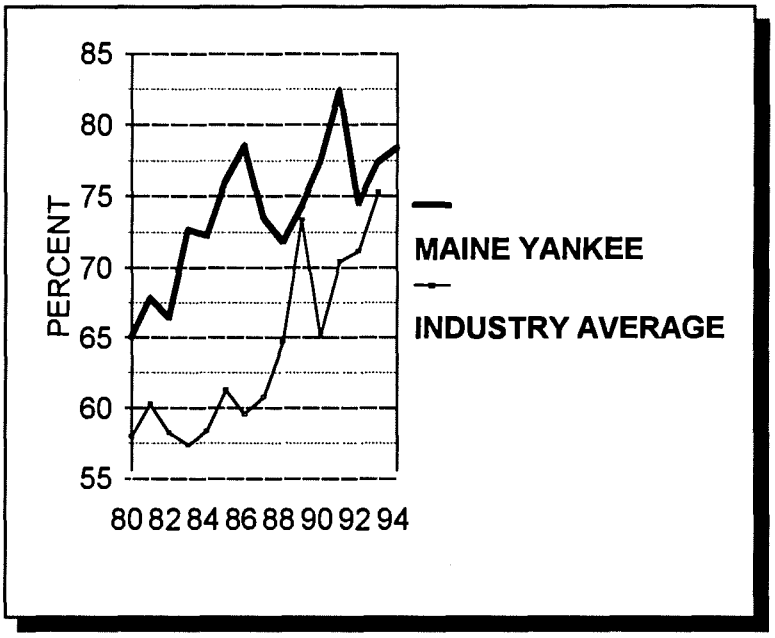

Figure 4 *Maine Yankee three year averaged capacity factor (MDC net) and U.S. pressurized water reactor industry average.*

The unit availability factor (UAF) for Maine Yankee is shown in Figure 5. This performance indicator is a measure of the time a nuclear plant was in operation. As in the case of the previous mentioned indicators, the UAF is lowered from 100% when a plant is shutdown for refueling or equipment repairs. For 1993, Maine Yankee achieved a UAF of 78.03% with a lifetime UAF of

77.3%. Data shows the plant has had no strong increase or decrease of outage down time from the norm.

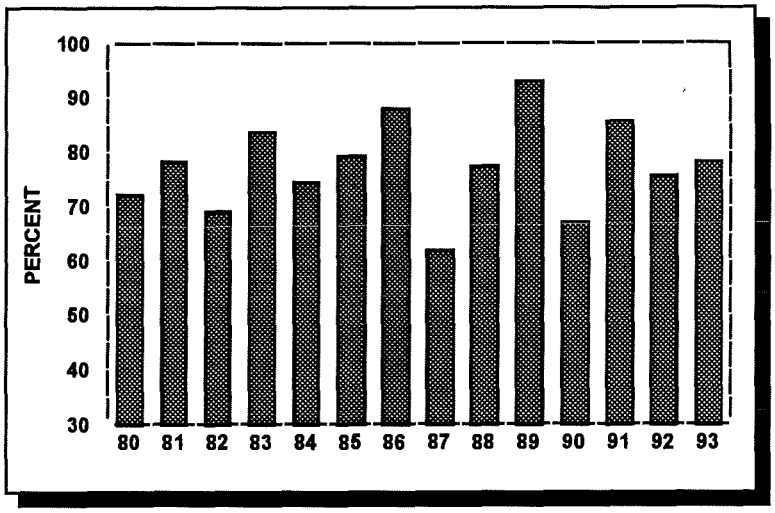

Figure 5 *Annual unit availability factor for Maine Yankee.*

On-site Safety at Maine Yankee

The authority to regulate activities at Maine Yankee primarily rests with the U.S. Nuclear Regulatory Commission (NRC). Throughout the year, Maine Yankee undergoes numerous inspections and reviews by the NRC to assure the plant is operating in compliance with Federal regulations. In addition the State of Maine has an on-site inspector to monitor various activities at the plant on a daily basis.

The number of hours that the NRC expends on inspecting Maine Yankee is about average compared to other operating power reactors in the U.S. During the 12 month period from December 1992 to 1993, the NRC expended 4,962 on-site inspection hours at Maine Yankee. The on-site NRC inspection hours for the nuclear industry ranged from 901 to 25,089 with an average of about 7,134 and a median of 6,474. During that same period, the NRC expended 8,830 off-site hours on Maine Yankee's operation. Again, this is about average for a nuclear power plant with the range varying from 6,103 to 30,891 hours, and averaging about 11,000 hours. The number of inspection hours expended by the NRC suggests that operations at Maine Yankee warrant normal attention and surveillance by the NRC.

In an effort to provide an understanding of how well Maine Yankee is performing with regard to nuclear safety and plant reliability, the NRC conducts an assessment of Maine Yankee's performance from the findings and conclusions of the NRC inspections and evaluations for an eighteen month period. In general, the objective of this assessment, called the "Systematic Assessment of Licensee Performance" Program, or SALP, is to highlight the strengths and weaknesses of a licensee's performance, and to assist the NRC management in making sound decisions regarding allocation of NRC resources used to oversee, inspect, and assess licensee performance. As of July 19, 1993, the NRC began conducting a revised SALP process that combined the number of functional areas assessed from seven to four. Specifically, the areas of emergency planning, radiological controls, chemistry, fire protection, housekeeping controls, and security were combined into the area of plant support. The other areas assessed are maintenance, engineering, and plant operations.

The most recent NRC SALP review for Maine Yankee was conducted for the period of June 28, 1992, to February 5, 1994. Each of the four functional areas assessed is given a rating of one, two or three -- a one indicating superior performance, a two indicating good performance, and a three indicating acceptable performance.

Overall, the NRC's assessment of Maine Yankee's performance was very good and remained relatively unchanged from the last SALP period. As shown in Table 1, the areas of plant operations, engineering, and maintenance received unchanged but good ratings of 1, 2, and 2 respectively. In the area of operations the NRC found excellent management oversight of the daily operations at the plant

Table 1

Functional Area	Last Period	This Period	
Plant Operations	1	1	
Engineering/Technical Support	2	2	
Maintenance/Surveillance	2	2	
Emergency Preparedness	1	1	**PLANT SUPPORT**
Security	2		
Radiological Controls	1		
Safety Assessment/Quality Verification	1		

with a safety oriented philosophy and a conservative approach to plant operations. The NRC also noted the effective training program at Maine Yankee for operators and staff contributing to the safe operation of the plant. The area of engineering was assessed by the NRC as continuing to be very good, however there were areas identified as room for improvement as in root cause analysis, and inadequate procedural controls for certain contractor-performed activities. Plant maintenance was also rated good by the NRC with many positive remarks. However, the NRC did find that Maine Yankee needed to provide better training and oversight of contractor workers. Plant support, which is a new category encompassing several functions at Maine Yankee, was rated as superior. Among other comments, the NRC noted Maine Yankee's improved performance in reducing personnel radiation dose, an effective security and emergency response program, and successful efforts to reduce radioactive waste volume. As with the maintenance and operations areas, the NRC noted some weaknesses with contract workers exhibiting poor work practices in spite of the noted improvements in Maine Yankee's radiological protection program.

The State Nuclear Safety Advisor found the NRC's analysis and findings of the SALP report consistent with the NRC inspection reports of Maine Yankee for the 18 month SALP rating period, from discussions with Maine Yankee during the period, and with reports and discussions from the State Nuclear Safety Inspector.

Radiological Safety at Maine Yankee

Worker Exposure

Some personnel at Maine Yankee can be exposed to radiation when working on the nuclear-side of the plant. To protect the health and safety of these workers, Maine Yankee is required by Federal law to monitor their exposure to radiation in order to assure doses do not exceed allowable levels. In addition, Maine Yankee, like all facilities where a potential exists for radiation exposure, is expected to follow good radiation protection practices that reduce radiation dose to workers - individually and collectively - as low as is reasonably achievable (ALARA).

The NRC assesses Maine Yankee's performance in protecting workers from radiation exposure by conducting announced and unannounced plant inspections and audits. The most recent comprehensive assessment of Maine Yankee by the NRC (the SALP report), found Maine Yankee's performance in radiological protection to be very good, with considerable improvement over several years ago.

The on-going improvements of Maine Yankee's radiation protection program were initiated by plant management in 1989, when the NRC found Maine Yankee's performance meeting regulatory requirements, but in need of considerable attention (as noted in the NRC 1989 SALP report). Maine Yankee responded to the NRC's concerns by acquiring various expert groups to conduct an in-depth review of the company's radiation program. The review identified the areas where improvement was needed, and a plan was developed to reorganize the program in June 1990 under the name of the Radiation Protection Improvement Plan (RPIP). The RPIP is still in effect at Maine Yankee, and has resulted in incremental but significant improvements over the years in reducing and controlling radiation exposure.

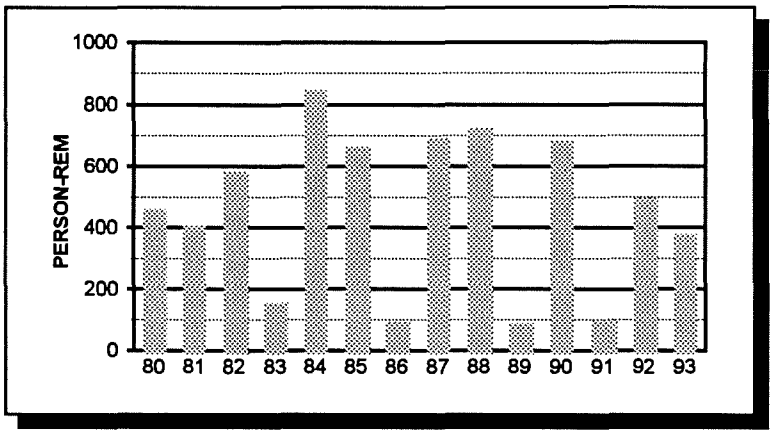

Figure 6 *Annual collective radiation dose for Maine Yankee.*

The general trend of declining radiation exposure to all the personnel at Maine Yankee (station employees and contractors) is shown in Figure 6. The annual exposure data show that since 1990 there has been a reduction in dose. In particular, the annual dose of 377 person-rem in 1993 represents the lowest radiological exposure at Maine Yankee during a refueling outage year since 1977. The 1993 refueling outage resulted in a dose of 361.6 person-rem.

At any nuclear power plant, the vast majority of radiation exposure typically occurs during refueling outages. The increase in radiation exposure does not necessarily increase to the individual, but is the result of contractors brought in who also receive radiation exposure resulting in an increase of radiation dose to the total work force as a whole. This is shown in Figure 7 where the percentage

of dose is considerably larger to contractor personnel than station employees during 1993 which was a refueling outage year. Maine Yankee is presently taking steps to improve the training of contractor workers to reduce radiation dose to these personnel.

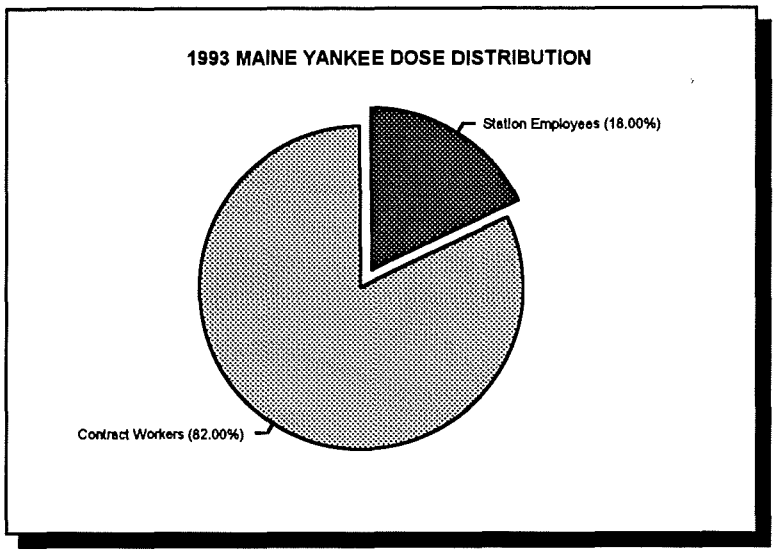

Figure 7 *Percent of 1993 total collective radiation dose to Maine Yankee station employees and contract workers.*

Maine Yankee's radiological performance compared to the U.S. industry average is shown in Figure 8. The graph displays Maine Yankee's three - year average collective radiation exposure compared to the U.S. pressurized water reactor (PWR) industry average. A three year averaged dose is a more accurate representation of radiological performance since a particular year may be high or low depending on whether it was a refueling year or non-refueling year , respectively. As shown, Maine Yankee's radiological performance was better than average from 1980 to 1984. But as the industry average began decreasing in 1983, Maine Yankee's performance did not follow the trend and remained relatively stable, until 1991 when Maine Yankee began to increase its focus on reducing dose at the plant. Several activities to reduce radiation exposure at the plant include chemical decontamination of certain piping, implementation of an enhanced hot-spot resolution program, and a continuing assessment of the effectiveness of the Radiation Protection Improvement Plan.

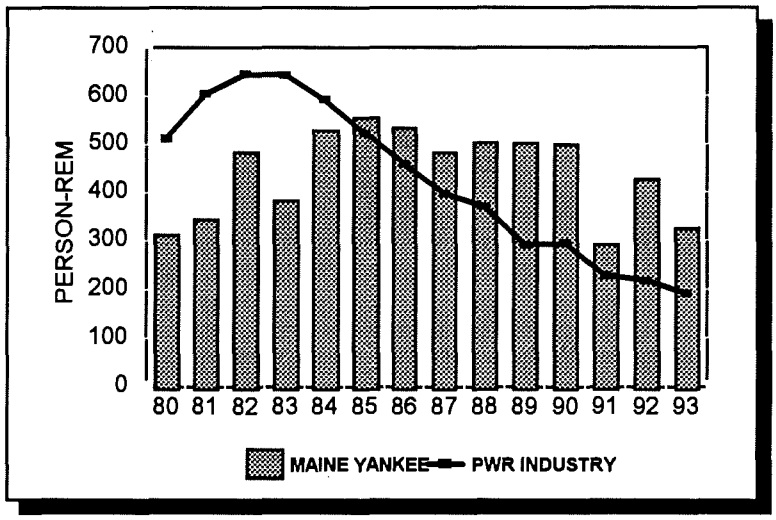

Figure 8 *Annual 3 year averaged collective radiation dose for Maine Yankee personnel and the U.S. pressurized water reactor industry.*

Revised Radiation Protection Regulation

Maine Yankee has updated their radiation protection programs to conform with the revised federal regulations for radiation protection (10 CFR 20). Maine Yankee implemented the new regulations prior to their 1993 refueling outage, well in advance of the effective date of January 1,

1994. The new radiation protection regulations are derived from the 1977 recommendations of the International Commission of Radiation Protection (ICRP), Publication 26. The most significant change in the revised regulation is a new system to calculate dose and limits to radiation exposure. The calculation of dose will now better approximate the total risk to the worker from radiation exposure. It will change the limits to radiation exposure to 5 rem per year, rather than a quarterly allowable dose limit of 3 rem. For the first time, the regulations provide for a radiation dose limit to an unborn child, and the practice of maintaining exposure to radiation as low as reasonably achievable (ALARA), is now explicitly stated in regulation.

Steam Generator Issue at Maine Yankee

On July 15, 1994, Maine Yankee began a safe shutdown of the plant due to increasing steam generator leakage. From July 16 to August 12, 1994, Maine Yankee performed an inspection of the steam generators and plugged defective tubes. The inspection of the steam generators revealed that the defects found in the steam generator tubes were most likely present in 1990, although to a lesser extent. Previous inspections of the steam generators in 1990, 1992, and 1993 did not detect the defect due to misinterpretation of the data acquired from instrumentation used to examine each tube. The result was that Maine Yankee found more than 300 tubes that had defects and required plugging. Of most concern, was that several of the tubes were found to be significantly degraded causing the Nuclear Regulatory Commission and the State to question the potential of a multiple tube rupture accident at the plant. (Maine Yankee is analyzed to withstand a single tube rupture). To measure the integrity of the severally defective tubes prompting the concern, Maine Yankee performed an in-situ pressure test on ten of the degraded tubes. The tests showed the tubes retained their integrity when subjected to pressures above normal operating conditions suggesting the plant was not operating in a condition that would have led to a multiple tube rupture. The Nuclear Regulatory Commission will be responding to Maine Yankee's analysis and corrective actions taken with regard to the integrity of the severely degraded tubes and future inspections of the steam generators in late January 1995.

With the plugging of about 300 tubes in 1994, the total number of steam generator tubes placed out-of-service is now 570 or 3.33%. This number of tubes plugged has not affected the power efficiency of the plant to date, however identifying tubes not meeting the integrity requirements is expected during future steam generator inspections. Maine Yankee predicts that efficiency of the plant will be reduced when more than 9% of the tubes are placed out of service. For the reasons of preventing efficiency loss and to potentially decrease the incidence of future tube corrosion, Maine Yankee has applied to the NRC to perform a repair procedure on the tubes called "sleeving". The repairing of steam generator tubes by sleeving entails the mechanical fitting or welding of a short length of tube inside the degraded tube. Because sleeving is a proven technology the NRC is expected to grant Maine Yankee approval to perform the procedure in time for the February 1995 refueling. Maine Yankee still anticipates the steam generators will last the life of the plant to 2008.

The Nuclear Safety Advisor and other state officials have been briefed by Maine Yankee with technical detail on this issue since its inception. This issue will receive an increase of focus in the future due to the safety significance.

University Students Contaminated Touring Maine Yankee

On October 11, 1994, ten University of Southern Maine (USM) Chemistry Students were led on a tour of the Maine Yankee plant by three plant personnel. The tour included a visit to the spent fuel pool on the radiological side of the plant. Prior to entering the radiologically controlled area of the plant, the students were each issued a pocket radiation dosimeter, and the guides were each issued an additional thermoluminescent dosimeter.

After completing the tour, the students and tour guides began processing out of the area which first begins by entering a portal radiation monitor to check for any radiation contamination. Five of the students and all three of the tour guides caused the portal monitors to alarm. Maine Yankee technicians concluded the contamination was most likely low-levels of Rubidium-88, a short-lived radioactive decay product of the radioactive gas Krypton-88. After a short time period to allow for the decay of the contamination, the students and guides were all able to pass through the monitors without causing them to alarm. The five exposed students were then taken to have a whole body scan to check for any internal radioactivity. No contamination was detected.

The cause of the contamination is believed to be radioactive gas that escaped during a process called resin sluicing. A tour guide had knowledge that the sluicing process was planned that day, but did not anticipate it starting before the completion of the tour.

This event has been reviewed by the State Nuclear Safety Advisor. The Advisor considered a report filed by the U.S. Nuclear Regulatory Commission, a report of events summarized by the State Nuclear Safety Inspector, documents prepared by Maine Yankee made available for inspection, and in-depth discussion with Maine Yankee personnel.

The most reliable and accurate indication of the radiation dose received by the exposed students and Maine Yankee personnel is from the three thermoluminesent dosimeters (TLD's) worn by the Maine Yankee guides. Pocket dosimeters issued to the students by Maine Yankee for the duration of the tour did not record a measurable radiation exposure.

The radiation dose recorded by the TLD's was less than the detection limit (10 millirem) of the device but can be conservatively interpreted to have measured no more than 6 millirem effective dose equivalent to an exposed individual. The internal radiation dose to the lung was estimated to be a fraction of the 6 millirem. However, the actual dose may have been well below this upper limit. In all, the dose received by the exposed individuals was very small representing less than 10% of the 100 millirem/year federal dose limit to a member of the public. Doses in this range carry a very small statistical risk of a health effect. (For perspective only, the dose from one dental x-ray has a similar risk.)

As a result of this event, Maine Yankee suspended tours into the radiological area of the plant until a review of their touring policy is completed. Maine Yankee is considering comments from State officials in the development of their touring policy.

OFF-SITE RADIOLOGICAL SAFETY

This section details and addresses the public and environmental impact from the routine releases of liquid and gaseous radioactive effluent from the Maine Yankee Nuclear Station. Total releases for 1994 are not compiled in final form until late Spring 1995, and are not included in this report.

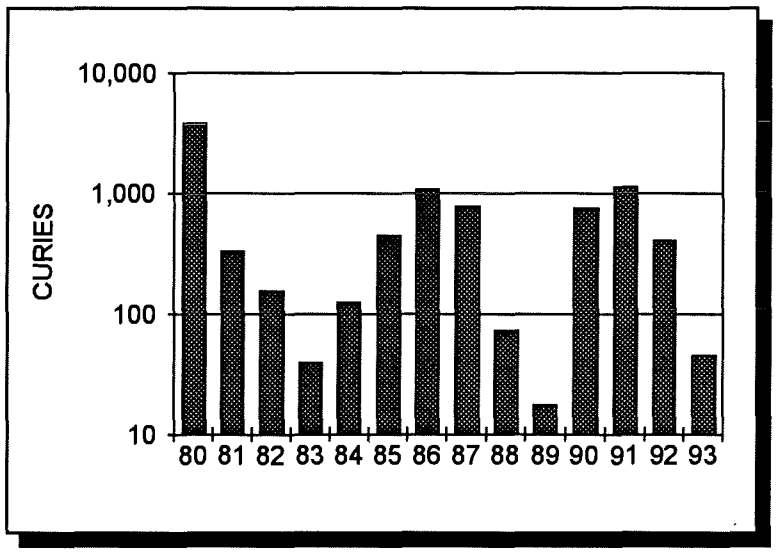

Figure 9 *Annual quantity of noble gaseous releases from Maine Yankee.*

Radioactive Gaseous Releases

Radioactive gaseous releases from Maine Yankee have declined slightly from 1991 to 1992, and decreased significantly in 1993. The primary cause for the decrease is from improved quality and control of fuel assembles used at Maine Yankee. Leaking fuel rods were primarily responsible for the increase of releases in 1974, 1980, 1986, and 1990.

The noble gas releases at Maine Yankee since 1980 are shown in Figure 9. Releases in 1993 dropped to 45 Curies from 402 Curies in 1992. Releases for the first six months of 1994 appear to continue the downward trend at 3.2 Curies.

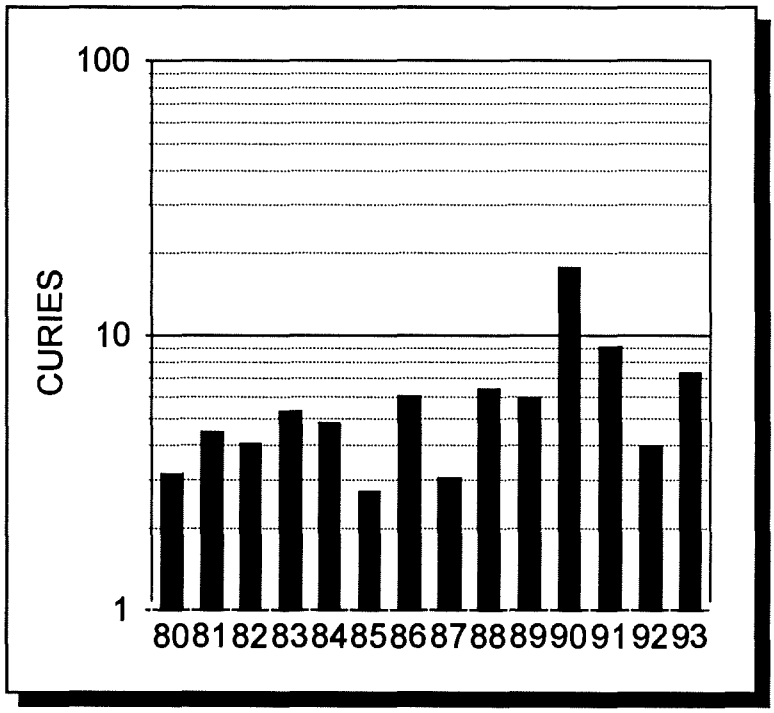

Figure 10 *Annual quantity of gaseous halogens released from Maine Yankee.*

The release of radioactive Halogens, as shown in Figure 10, dropped significantly in 1991 and remained lower than historical levels into the first half of 1994. Releases of Halogens are reported in the millicurie range (one-thousandth of a Curie). Releases of gaseous radioactive Tritium are shown in Figure 11. Releases from 1991 to 1994 vary below 10 Curies per year and are not very different from previous years. To date, all radioactive gaseous releases from Maine Yankee have been well below Federal regulatory limits.

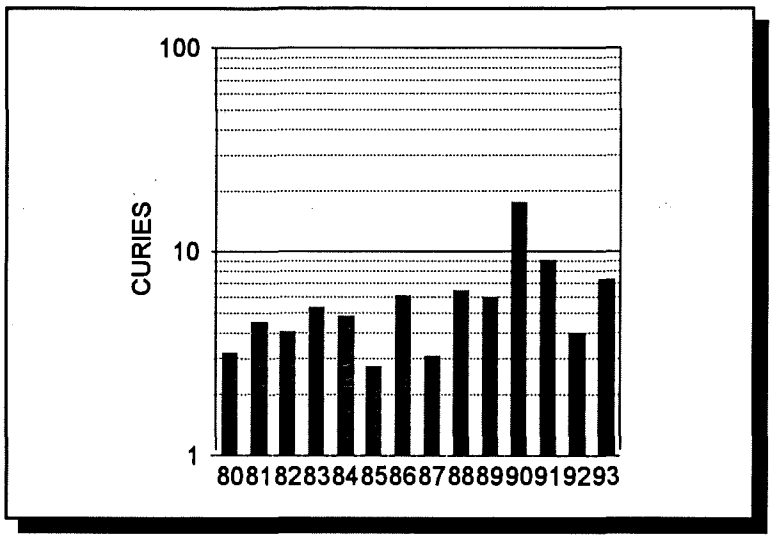

Figure 11 *Annual quantity of gaseous Tritium released from Maine Yankee.*

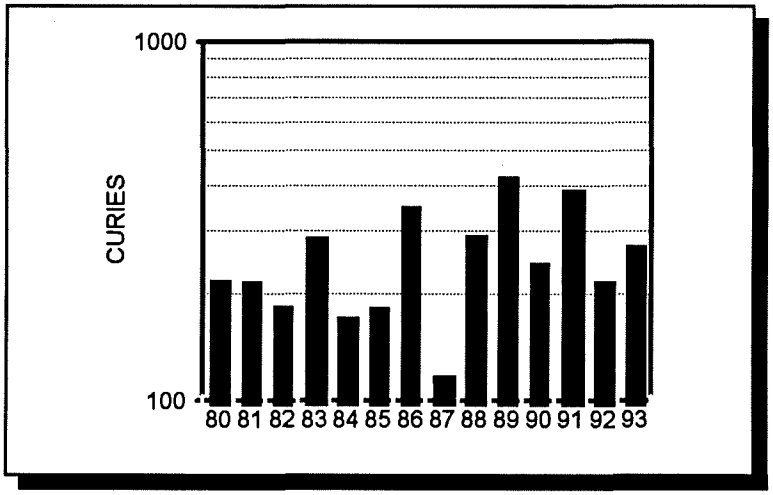

Figure 12 *Total annual Tritium liquid effluent releases from Maine Yankee.*

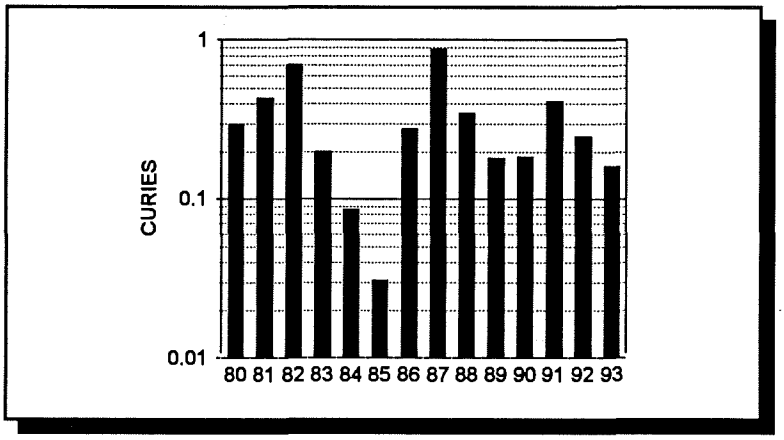

Figure 13 *Annual releases of liquid fission and activation products (particulates) from Maine Yankee.*

Radioactive Liquid Releases

Radioactive liquid releases from Maine Yankee displayed a general decline since 1991 similar to the gaseous releases. Radioactive Tritium always constitutes the majority of the releases with 272 Curies in 1993 and 0.163 Curies of liquid fission and activation products (particulates) in the same year. Shown in Figures 12 and 13, is the history of releases of liquid Tritium and fission and activation products from Maine Yankee since 1980. Releases for the first half of 1994 are consistent with previous years at 158 Curies and 0.04 Curies for Tritium and fission and activation products, respectively.

Relating the quantity of radioactive material released to the environment from the Maine Yankee operation to a health-based risk requires calculating the potential radiation dose from each specific material released. Different materials, given the same quantity, present a greater or lesser hazard. Thus, 200 Curies of noble radioactive gas released from Maine Yankee would typically produce a very small dose, while the release of 200 Curies of a halogen such as radioactive Iodine would be unacceptable and of considerable concern to public health.

The total estimated dose to an individual in the vicinity of Maine Yankee from all effluent exposure in 1993 is estimated at 0.012 millirem total effective dose equivalent (TEDE). The regulatory limit is 100 millirem/year.

Low-Level Radioactive Waste

The annual volume of low-level radioactive waste (LLRW) generation at Maine Yankee is continuing to decrease. Improvements in reducing the radioactivity content of the waste is also apparent, and is partly related to the improved integrity of the reactor fuel assembles. In 1994, Maine Yankee generated 1,400 cubic feet of LLRW with a total radioactivity of 4 Curies. Figure 14 and 15 show the annual volume and radioactivity of low-level radioactive waste from the Maine Yankee plant.

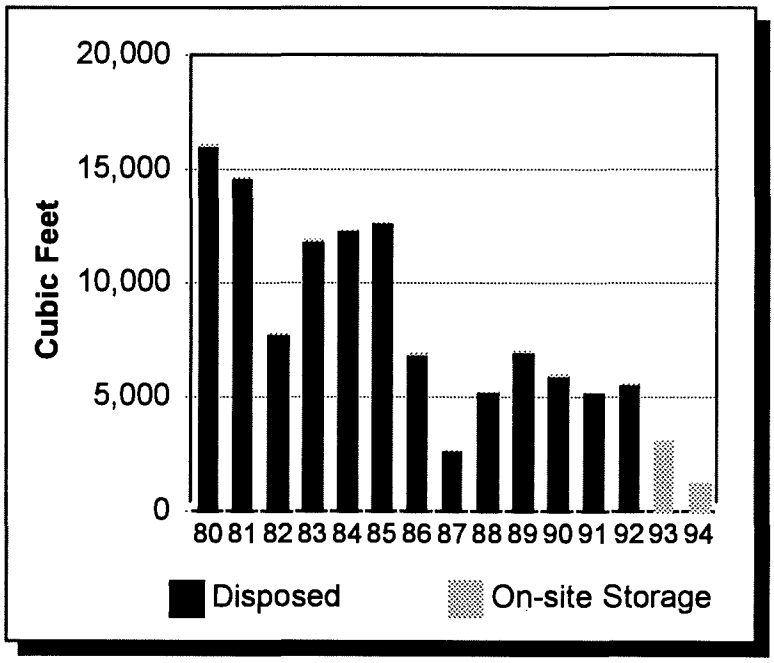

Figure 14 *Annual volume of low-level radioactive waste from Maine Yankee shipped to a burial facility or placed in on-site storage.*

As of January 1, 1993, Maine Yankee no longer had access to a disposal facility and all low-level radioactive wastes are now stored in a dedicated building at the plant site.

Stored wastes are safely packaged and inventoried. The volume of waste in the building as of November 1994 is 4,342 cubic feet. The radioactivity of the waste when placed in storage is about 64 Curies, and will continually decrease due to radioactive decay. Upon the opening of the Texas Disposal facility expected in 1997, the waste will be transported and properly disposed.

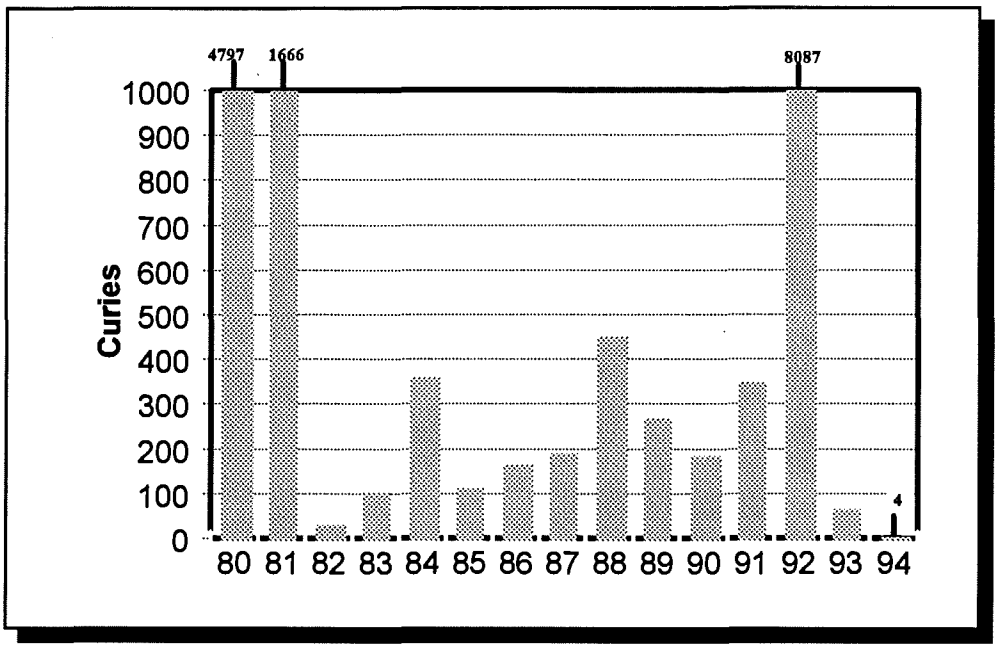

Figure 15 Annual quantity of radioactivity in low-level radioactive waste from Maine Yankee.

Environmental Radiation Monitoring Network

Installed within a one-mile radius of Maine Yankee are seventeen remote radiation monitors controlled and operated by the State. The monitors continuously transmit radiation exposure rate data to a central computer located at the Office of the State Nuclear Safety Inspector at Maine Yankee. The purpose of the State Environmental Monitoring Network (ERM) is to detect and record radiation exposure levels from radioactive gaseous discharges at Maine Yankee. Though the sensitivity of the system appears to be fairly good from the apparent detection of natural Radon build-up from advancing weather fronts, detection of Maine Yankee gaseous releases are difficult to verify. Since the system became operational in March 1989, radiation measurements recorded have ranged within the fluctuations of natural background radiation levels.

In 1995, the Maine Radiation Control Program and the State Nuclear Safety Advisor will undertake steps to improve the interpretation and quality of the data acquired from the ERM system.

Volunteer Monitoring Program

Within a ten mile radius of Maine Yankee, radiation monitors are made available to the public for the detection of radioactive releases from Maine Yankee. In 1994, approximately 40 persons volunteered to participate in this Volunteer Monitoring Program which is managed by the Division of Health Engineering (DHE). Citizens who participate record radiation data on a weekly basis and report their findings to DHE on a monthly basis. To date, all data received from the public indicates normal levels of radiation as expected from natural background sources.

Environmental Radiation Surveillance Programs

The Radiation Control Program within the Division of Health Engineering (DHE) has an ongoing program of collecting environmental samples, to be analyzed by the Maine Environmental and Health Laboratory for radioactivity. The purpose of the program is to determine if there is any radioactive contamination in the environment resulting from releases of radioactive gaseous and liquid effluent at Maine Yankee. On a routine basis, the DHE collects samples of fresh water, salt water, seaweed, vegetation, milk, fish, sediment and air to test for radioactivity. Analyses of samples collected for 1993 and part of 1994 have been completed and reviewed by the Division of Health Engineering, and the Nuclear Safety Advisor. Other than a small number of samples, no detectable quantities of radioactivity were found that could be attributed to the Maine Yankee operation. The few samples where trace quantities of radionuclides that are attributable to the Maine Yankee operation were detected were found in quantities approaching the lower-limit of instrument detection and do not pose any risk to public health.

On a routine basis, the DHE also collects environmental samples for the Nuclear Regulatory Commission to analyze. Again, there was detection of trace radionuclides attributable to Maine Yankee in a few samples, but the quantities do not pose a public health risk. The natural radioactivity found in all samples far exceeded any radioactivity attributable to the Maine Yankee Station.

The NRC and the DHE have placed radiation detectors, called Thermoluminescent Dosimeters (TLD's) at various locations within a ten-mile radius of Maine Yankee. The purpose of these detectors is to establish the background radiation level. However, if a significant radioactive release occurred at Maine Yankee the TLD's would record the radiation exposure. Data collected from the NRC and State TLD's since the initial operation of Maine Yankee in 1972 have not detected any levels of radiation beyond what could be expected from natural background.

In addition to the State and NRC programs to monitor environmental radiation, the NRC requires Maine Yankee to do the same. Environmental samples collected by Maine Yankee are analyzed by an independent laboratory, which in this case is the Yankee Atomic Electric Company Environmental Laboratory in Westborough, Massachusetts, and quarterly reports, as well as an annual report of the analysis, are made available to the State.

Maine Yankee compiled and submitted to the NRC a summary and analysis of the radiological environmental data collected for the calendar year of 1993.[1] With few exceptions, the vast number of environmental samples did not reveal any detectable radioactivity from Maine Yankee. The exceptions are three crabs sampled from Long Ledge and silt removed from the Circulating Water System Intake Bays. The levels of radioactivity measured were small, and do not pose a risk to public health.

Of noteworthy interest, some of the samples collected, such as the fish and sediment, are split between the State and Maine Yankee for comparative analysis. Results of the inter-comparative analysis indicate a good laboratory precision between the State and the Yankee Atomic Laboratory.

Maine Yankee Emergency Planning

In the event of a radiological emergency at Maine Yankee, the State and Maine Yankee have emergency plans to protect the health and safety of the public. Annually, Maine Yankee conducts an emergency exercise that is inspected and observed by the NRC. The State of Maine monitors and participates in these exercises, but not to the full extent as during the biennial exercises that are scheduled and observed by the Federal Emergency Management Agency (FEMA). The biennial emergency exercises include full participation by Maine Yankee, the State of Maine, and the 16 cities and towns surrounding the plant.

A full participation exercise was held on September 23, 1994. An evaluation by FEMA of the performance by the State of Maine is expected in late 1995. Early indications are the exercise went well without incident, and the State is adequately trained and prepared to respond to an emergency at Maine Yankee.

During the exercise, Maine Yankee's performance was observed and inspected by the NRC. The NRC found no violations in Maine Yankee's performance during the drill, and no weaknesses. The NRC report commented on Maine Yankee's strengths in command and control, and in accident assessment and mitigation.

Several improvements in 1994 were instituted to the state's assessment capabilities in the event of an emergency at Maine Yankee. Maine Yankee has made available to the state a radiological assessment computer program called METPAC. In the past, METPAC was only used by Maine Yankee to make dose projections. The state now has the capability to independently verify any dose projections using this more sophisticated analysis tool.

The State is in the process of installing the Maine Emergency Response Display System, known as MERDS. The MERDS accesses data on Maine Yankee operating parameters that can be used to assess the status of the plant in real time. This information would be monitored in the event of an emergency at the plant. Other states have similar systems which are available via a connection

[1] Maine Yankee Atomic Power Station, Annual Radiological Environmental Surveillance Report, 1993, submitted to the Nuclear Regulatory Commission, King of Prussia, PA., May 2, 1994.

with the U.S. Nuclear Regulatory Commission in Washington, D.C. However these systems are only activated during the "Alert" phase of an emergency. Maine Yankee has cooperated with the State to make their plant information available at all times. In addition, the MERDS will be connected with an autodialer system which will ring state officials if certain plant parameters are exceeded. This will provide the state with 24 hour coverage of the Maine Yankee operation.

Low-Level Radioactive Waste

Background

In Maine, industries, hospitals, universities, and research laboratories produce radioactive waste products as a result of their activities. Some of the radioactive wastes produced in Maine decayed in storage and in a short time can be disposed by conventional means. Wastes that can not be decay in storage require disposal in a licensed facility. As of January 1, 1993 Maine no longer had access to any of the licensed out-of-state facilities due to provisions set forth in the Federal Low-Level Radioactive Waste Policy Amendments Act of 1985. From this date, generators of waste in Maine were required to safely store waste on-site until Maine built its own licensed facility or negotiated a contract or compact with one or more states.

In the spring of 1993, the Public Advocate successfully negotiated an out-of state solution via the Texas, Maine, Vermont Compact for the disposal of Maine generated waste over a 30-year period at a proposed facility in Hudspeth County, Texas. The Compact was approved by the 116th Maine Legislature and the Governor resulting in a suspension of all siting activities for a disposal facility in Maine. Maine law required voter approval of the Compact by referendum. It received a large majority of support in the 1993 election. The Compact still requires Congressional ratification which is expected to be addressed in 1995.

Progress in 1994

The Legislation in 1993 which approved the Texas Compact and terminated the siting activities of the Maine Low-Level Radioactive Waste Authority, also directed the State Planning Office to provide recommendations on restructuring state government activities to comply with the Texas Compact. Deliberation on the recommendations and accompanying legislation, led to the termination of the Maine Low-Level Radioactive Waste Authority, and the consolidation of radioactive waste management and regulation to the Radiation Control Program within the Department of Human Services, Bureau of Health. Also, the membership and the budget of the Advisory Commission on Radioactive Waste was modified, and the State Planning Office was given the responsibility to manage the one-time payments to Texas as specified in the Texas Compact contract. This restructuring resulted in streamlining and consolidating state government management and regulation of radioactive wastes, as well as a cost savings. Also in the Spring of 1994, legislation was passed and signed by the Governor to provide the Portsmouth Naval Shipyard (PNS) short-term access to the Barnwell low-level radioactive waste facility in South Carolina. This action was deemed necessary to assure that operations at the PNS would not be disrupted due to lack of waste storage capacity in the event the Texas facility opening was delayed.

High-Level Radioactive Waste

Both Maine Yankee and the Portsmouth Naval Shipyard handle high level radioactive waste (HLW) in the form of nuclear spent fuel assemblies. However, the issue surrounding the storage and removal of the HLW is different for the two facilities.

The Portsmouth Naval Shipyard (PNS)

The naval shipyard in Kittery performs refueling and defueling operations for nuclear propelled submarines. In years past, nuclear fuel assemblies removed from the submarines were shipped to the Idaho National Engineering Laboratory (INEL) Expended Core Facility for examination and storage. However, since June 1993, spent fuel shipments to Idaho have been limited until an Environmental Impact Statement (EIS) ordered by a Federal District Court in Idaho was completed. The EIS covers all DOE spent fuel management (2800 metric tons of heavy metal) over the period 1995 to 2035; naval spent fuel constitutes about 2% of that amount.

The DOE spent fuel management draft EIS was published in June 1994 for public comment. The draft EIS presented a wide range of alternatives, including the option of storing on-site naval spent fuel generated at PNS pending ultimate disposition. The Navy's preferred alternative for naval spent fuel, identified in the draft EIS, is to continue shipping the fuel to INEL as has been safely done since inception. This conclusion was based upon consideration of environmental, socioeconomic, mission, and cost impacts of each alternative. According to the draft EIS, the alternative to store spent fuel at the Naval shipyards, such as the PNS, has negligible environmental impacts, but was not preferred for reasons including costs and the inability to fully inspect and examine the fuel.

The final EIS and Record of Decision is expected to be completed in June 1995. In the interim, spent fuel in shipping containers is safely stored on-site at PNS and other shipyards pursuant to an Environmental Assessment and Finding of No Significant Impact issued in January 1994.

Maine Yankee

Maine Yankee, similar to all nuclear power plants, produces highly radioactive waste in the process of making electricity. This waste is the spent nuclear fuel removed from a reactor during refueling operations. Since the beginning of Maine Yankee's operation in 1972, the spent fuel removed from the reactor has been stored on-site in a specially designed pool filled with borated water to cool the spent fuel and provide shielding from the radiation emitted.

When Maine Yankee was under construction in 1968, spent fuel removed from commercial nuclear power plants was to be stored temporarily at the plant site, and then transferred to the DOE for reprocessing or disposal. As is well known nationally, reprocessing efforts of nuclear fuel in the U.S. did not succeed, and the search and construction of a high level waste repository has been seriously delayed. The result is all commercial nuclear power plants in the U.S. have been required to store all their spent fuel on-site, and provide for additional on-site storage capacity as needed. Maine Yankee redesigned the configuration of the spent fuel pool in 1975 and in 1983 to increase the number of spent fuel assemblies that can be safely stored. The re-racking of the pool in 1983

provided sufficient capacity for spent fuel generated until 1996. Because the DOE is unlikely to take possession of the spent fuel until 2010 or beyond, Maine Yankee was confronted with the prospect of adding additional storage capacity for spent fuel or facing an indefinite shutdown of operations in 1996.

On October 5, 1992, Maine Yankee announced to the State a decision to proceed with a re-racking license amendment application to the Nuclear Regulatory Commission (NRC). The re-racking of nuclear fuel will involve placing the existing spent fuel in specially designed storage racks that will reduce the distance between spent fuel assemblies, and thus enable more spent fuel to be stored in the existing pool on-site. Maine Yankee chose this option because it does not require any new technology, and the plant has considerable industrial experience from the previous re-racking projects in 1975 and 1983.

Maine Yankee first presented their re-racking plan to the NRC on October 15, 1992, followed by a request for a license amendment to the NRC on January 25, 1993. The license amendment request was to allow Maine Yankee to increase the number of spent fuel assemblies from 1476 to 2019 to be stored in the Maine Yankee Spent Fuel Pool. This will accommodate sufficient capacity through the duration of Maine Yankee's operating license (2008).

During the application review process by the NRC, the State also reviewed the project. Questions and concerns of the project posed to Maine Yankee by the State have been adequately addressed, and a letter was issued by the State to the NRC noting that it had no objections to the project. With the receipt of the State of Maine's review, the NRC approved the re-racking project on February 2, 1994.

Maine Yankee is scheduled to re-rack the pool during late spring and summer of 1995. The State will be monitoring the project to assure all safety concerns are met.

Loring Air Force Base Environmental Restoration

The Maine Department of Environmental Protection (DEP) is currently engaged in overseeing the clean-up of the Loring Air Force Base (Base) in Limestone. The Base is a U.S. Environmental Protection Superfund site with areas contaminated with chemical wastes and pesticides, and a small fraction contaminated with buried low-level radioactive wastes.

The Nuclear Safety Advisor is assisting the DEP Project Manager in the review of the radiological aspects of the Base restoration. Assistance to the DEP has included review of radiological Health and Safety Plans, Operational Work Plans, and coordination of the DEP with the University of Maine Environmental Radiation Laboratory to conduct a radiological characterization of potentially contaminated areas at the Base.

Low-level radioactive wastes were found buried in the Weapons Storage Area of the Base. The LLRW is the result of activities involving the maintenance of strategic weapons on the Base

during the late 1950's and early 1960's. In early 1994, a complete survey of the base was completed by the University of Maine Environmental Radiation Laboratory, and the two trenches where waste was buried were characterized by the Air Force. The waste was removed from the trenches and loaded into lined rail cars for shipment and disposal at Envirocare, Inc, a licensed facility outside of Salt Lake City, Utah. A total of 19.5 rail cars transported 31,000 cubic feet of contaminated soil and mixed debris exhumed from the two trenches. Preliminary measurements indicate that all contaminated soil has been recovered, and the goal to clean-up to background levels of radioactivity apparently has been reached. It is expected all clean-up operations of the weapons storage area will be completed by summer 1995.

Although Maine generators of low-level radioactive waste in general do not have access to a disposal facility at this time, certain bulk wastes such as radioactively contaminated soils and demolition debris can qualify for disposal at the Envirocare facility in Utah, as is the case for the wastes exhumed from the Loring Air Force Base. The Envirocare disposal facility is privately owned and is not subject to the U.S. Low-Level Radioactive Waste Policy Act PL 99-240. However, the State of Utah has an agreement with the Northwest Compact to operate the Envirocare facility in a manner as not to frustrate the intent of PL 99-240. Thus, Envirocare only accepts non-reactor, large volume bulk materials from States that have met the 1988 or 1990 milestones of PL 99-240, except when approval by the Northwest Compact has been provided.