REPORT

OF THE

STATE NUCLEAR SAFETY ADVISOR

SUBMITTED TO THE

117th MAINE LEGISLATURE

January 22, 1996

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State Nuclear Safety Advisor
Executive Department
Maine State Planning Office

STATE OF MAINE
EXECUTIVE DEPARTMENT
STATE PLANNING OFFICE

ANGUS S. KING, JR.
GOVERNOR

EVAN D. RICHERT, AICP
DIRECTOR

January 22, 1996

Members of the 117th Legislature,

I am pleased to submit to you the 1996 annual report of the State Nuclear Safety Advisor.

In previous years, my annual report to the Maine Legislature summarized 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. As is well known, Maine Yankee only operated the first two weeks in January 1995, and remained shut down for almost exactly one year to undergo a major repair, and to address technical issues on safety systems brought forth by an anonymous allegation. This report summarizes the activities and findings of the State with regard to these issues.

This report also briefly discusses the status of high-level and low-level radioactive waste management in Maine, and my activities associated with the Northeast High-Level Radioactive Waste Transportation Task Force.

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 will aid in understanding nuclear safety issues, and will contribute to informed decision-making.

Sincerely,

Uldis Vanags
State Nuclear Safety Advisor

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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 1995, 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

Background

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 (1989) 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, historically supplying slightly above 20% of Maine's electricity needs.

Historically, Maine Yankee has operated reliably, efficiently, and safely. However, last year Maine Yankee operated for only a few weeks in January 1995 before having to shut down due to an electrical generator failure, and subsequently identify serious degradation in the three steam generators which kept the plant under repair for the remainder of the year. After the completion of the repairs, start-up of the plant was further complicated and delayed by the advent of serious allegations on Maine Yankee safety analysis.

Due to the essentially non-operational status of Maine Yankee for 1995, State activities were primarily focused on the extensive repair by Maine Yankee, and the impact of allegations concerning Maine Yankee safety analysis. What follows is a summary of the State's activities and analyses on the Maine Yankee steam generator repairs, and the inquiry and impact of the allegations.

Steam Generator Repairs

Last year when performing an inspection of the steam generator tubes, Maine Yankee found that over half of the approximately 17,000 steam tubes contained within the plants three steam generators had varying indications of cracking at a location common to all. Maine Yankee chose to repair the cracks in each of the tubes by inserting and laser welding a sleeve in the affected region of all the usable tubes, whether crack indications were present or not. Repairing of steam generator tubes by sleeving is not uncommon in the nuclear industry, however the sleeving of all tubes was the first in this country [1]. For this reason and that the steam generators are vital to nuclear power plant safety, Governor King felt strongly that the State needed to independently establish the integrity of the sleeving project at Maine Yankee. Toward this goal, a

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[1] Comprehensive sleeving of steam generators has been done at the DOEL 4 nuclear power plant in Belgium. Maine Yankee utilized the experiences at DOEL to refined the process of sleeve installation.

team of experts was assembled to evaluate the Maine Yankee sleeving project and report directly to the Governor. The Technical Oversight Team (Team) is composed of myself, Patrick Dostie, State Nuclear Safety Inspector, Dr. Chona and Dr. Bray of Texas A&M, and Dr. Moore of the University of Southern Maine. Dr. Chona is a professor in fracture and stress mechanics, Dr. Bray is a professor in inspection techniques, and Dr. Moore is a professor in metallurgy.

On December 1, 1995, the full Team reported their findings to the Governor. In brief, the Team concluded that the repair undertaken by Maine Yankee is technically sound, and that Maine Yankee undertook appropriate measures to assure the installation of the sleeves would result in reliable and predictable performance. As a result, the State concluded that no health and safety related issues have been identified that would prevent Maine Yankee from returning to full power. The Technical Oversight Team is being retained to evaluate the performance of the sleeves upon the first inspection anticipated in 18 months.

U.S. Nuclear Regulatory Commission Confirmatory Order

After the Technical Oversight Team briefing the Governor on Friday, December 1, 1995, the following Monday I received an anonymous letter of allegations concerning safety issues at Maine Yankee, forwarded to my attention by the Union of Concerned Scientists. The letter alleged that Maine Yankee manipulated (1) a computer program to get a desired result needed to support a safety analysis to the Nuclear Regulatory Commission to obtain a power upgrade in 1989, and (2) an analysis to assure the containment pressure would not be exceeded beyond the design level in the event of an accident. The following day I submitted a copy of the allegations and all supporting material to the Nuclear Regulatory Commission (NRC) with a request for an investigation. The NRC acted immediately and assembled an inspection/assessment team to review documents and interview employees at Yankee Atomic Electric Company (YAEC) in Bolton, Massachusetts. (YAEC provides engineering support to Maine Yankee as well as other Yankee nuclear power plants in New England.) The NRC invited myself and Patrick Dostie, State Nuclear Safety Inspector, to observe the 4 day assessment. Both the State Inspector and I found the NRC assessment to be rigorous and comprehensive.

On January 3, 1996, the NRC issued a Confirmatory Order based on the findings of the assessment at Yankee Atomic. The Order limits the power of Maine Yankee to its original design level of 2440 Megawatts thermal, which is a 10% reduction from its full power rating. It also requires Maine Yankee not to operate the plant with a containment pressure exceeding 2psig. Under the conditions set forth in the NRC Order, I have no objection to the restart of the Maine Yankee plant and I agree with the NRC assessment that the operation at the reduced power level will not pose any undue risk to the public or environment. I summarized the primary bases of my reasoning for safe operation in Attachment 1 of this report.

Although Maine Yankee will be returning to power, the investigation into the allegations will continue. NRC has assured me that the resolution of the allegations, both the technical

aspects and any wrong doing, has been given a high priority in its organization. The State will continue to monitor all NRC proceedings, including inspections associated with the allegations. In addition, Governor King has requested and received the assistance of Donald Zillman, Dean of the University of Maine School of Law, to serve as a member of the State team in these proceedings. As deemed necessary, the Governor will supplement State personnel with other expert assistance to assure the allegations are addressed thoroughly and to finality.

Low-Level Radioactive Waste

Background

In Maine, Maine Yankee as well as other industries, hospitals, universities, and research laboratories produce radioactive waste products as a result of their activities. Some of the radioactive wastes produced is decayed in storage and in a short time can be disposed by conventional means. Wastes that can not be decayed in storage requires 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.

Maine expected the required Congressional ratification of the Texas, Maine, Vermont Compact in 1995. However, a turn of events in Congress has delayed the vote for ratification. On September 18, 1995, a vote in the House defeated a measure to pass the Compact without debate due to concerns expressed by some Texas Representatives on the siting of the facility in Hudspeth County, Texas. As a result, a second vote was held on December 19, 1995 where the House did approve the rules for debate. To date, no date for the debate has been scheduled, however there is optimism in Texas, Maine, and Vermont that the Compact will receive ratification sometime this year.

As of July 1, 1995, all states of the nation, except South Carolina, were given access to the Barnwell facility in North Carolina for the disposal of low-level radioactive wastes (LLRW). Since July 1, 1995, Maine Yankee has shipped 2035 cubic feet of LLRW to Barnwell for disposal, and 1,072 cubic feet remain in on-site storage as of January 15, 1996.

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. As of October 1995 rail shipments of nuclear fuel assemblies removed from the submarines have been resumed to the Idaho National Engineering Laboratory (INEL) Expended Core Facility for examination and storage. Prior to the resumption of nuclear fuel shipping activities, spent fuel shipments to Idaho have been limited since June 1993 awaiting completion of an Environmental Impact Statement (EIS) ordered by a Federal District Court in Idaho. The EIS encompassed 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, was 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 Record of Decision released in June 1995 selected the preferred alternative in the EIS, which would send all Navy spent nuclear fuel to Idaho for examination and storage pending relocation to a permanent geologic repository. In October 1995, agreement among the Navy, the DOE, and the State of Idaho provided for all Navy spent nuclear fuel to Idaho through 2035, and allowed 24 container shipments through the end of 1995. Spent fuel shipments resumed on October 20, 1995. However, Shoshone-Bannock Indian Tribes temporarily blocked a shipment (not from Portsmouth Naval Shipyard), claiming they were not a party to the agreement made with the State of Idaho. Negotiations with the Tribes resulted in agreeing to permit shipments to continue in November 1995 while resolving the disagreement.

As of January 4, 1996, all loaded spent nuclear fuel containers at PNS have been shipped, and two empty containers are available to support the overhaul of the USS DALLAS, presently underway.

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 originally planned to re-rack the pool during late spring and summer of 1995, however due to the extensive steam generator project in 1995 the re-racking project will be

implemented during spring/summer 1996. The State will be monitoring the project to assure all safety concerns are met.

Northeast High-Level Radioactive Waste Transportation Task Force

The Council of State Governments/Eastern Regional Conference (CSG/ERC) entered into a Cooperative Agreement with the federal Department of Energy to identify and analyze issues associated with the interstate transportation of commercially-generated, high-level radioactive waste. A major component of this agreement is the creation of the Northeast High-Level Radioactive Waste Transportation Task Force. The Task Force is composed of Governor-appointed state government officials from Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, and Vermont. The Task Force has three primary objectives: coordinate interaction and information exchange among state officials on spent nuclear fuel and high-level radioactive waste transportation issues; provide comment and input on the Department of Energy (DOE) programs and policies for managing spent nuclear fuel; and publish and distribute informational documents on these issues. I have been appointed by Governor King to represent Maine in this Task Force.

To date, the Task Force has provided comments to the DOE on the need for full scale testing of shipping casks, and comments on the implementation of Section 180 © of the Nuclear Waste Policy Act which provides for funding to states for emergency response training. Recently, the Task Force unanimously passed a resolution on spent fuel transportation. The resolution states that spent fuel transportation is an issue requiring careful planning, training, and implementation; and that spent fuel transportation can be done safely and should not be an impediment for interim storage. A copy of the resolution is provided as Attachment 2.

Activities of the Task Force this year include the publication of a White Paper that will discuss the issue of which roads and railways will be used to transport commercial spent fuel out of the Northeast Region. More specifically, it will also present the Task Force's recommendations on how this critical decision should be made; i.e., what criteria should be used to determine the road and rail routes, the process that should be followed to develop those criteria, and suggested routing scenarios, based on the Task Force's combined knowledge and expertise on these issues. It should also be noted that the routing assumptions in the White Paper are based on a waste acceptance scenario to the proposed Yucca Mountain centralized storage facility.

Primary Bases for Safe Operation of Maine Yankee

RELAP5YA not to be used

The computer code called RELAP5YA, which is under question by the NRC, is not being used to support the Small Break Loss of Coolant Accident Analysis (SBLOCA) for the current operating cycle (Cycle 15) at Maine Yankee. In addition, Maine Yankee has identified other areas where the RELAP5YA code has been used, and has provided an analysis of the impact in the required submittal to the NRC before bringing the plant to criticality. (Criticality is the fission process in the nuclear fuel that produces energy in the form of heat). With regard to Maine Yankee meeting the requirements of SBLOCA post Three Mile Island (which is one of the issues why Maine Yankee is not allowed to operate at 100% power), I have received assurance from the NRC that operating at the lower power of 2440Mwt provides sufficient margin such that the post Three Mile Island requirements for SBLOCA would be met.

Containment pressure restricted to 2 psig

At the NRC inspection/assessment, it was identified that Maine Yankee's containment peak accident pressure analysis for 100% power would actually exceed Maine Yankee's containment design pressure of 55 psig if Maine Yankee operated with a containment pressure of 3 psig, as allowed by their Technical Specifications. A review of the history of containment pressures at Maine Yankee by the NRC indicates that the plant has never exceeded 2 psig while in operation, which supports the analysis showing that Maine Yankee has not exceeded their containment design bases of 55 psig at a power level of 2700 Mwt, but is exceedingly close at 54.8 psig. Since Maine Yankee essentially meets the requirement at full power, the reduction of power to 2440 Mwt would result in lowering the containment peak accident pressure due to a lower energy input into the analysis.

2440 Mwt previously analyzed

The operation of Maine Yankee at 2440 Mwt is the original design power limit for the plant. This power level has been previously analyzed by the NRC, and is bounded by NRC approved analysis methods for non-LOCA transient analysis and large break LOCA analysis.

Verification of Maine Yankee submittal to NRC

Per the NRC order, Maine Yankee can bring the plant to criticality upon submission under oath of information and analysis to support cycle 15 operating limits, among other requirements. NRC has publicly stated that an inspection of Maine Yankee's submittal will occur within two weeks of

the plant going critical, and the State has been invited to observe. I am satisfied with the provisions of the NRC order for (1) the actions taken by the NRC are consistent with the issues identified during the thorough inspection/assessment at Yankee Atomic in Bolton, Massachusetts, and (2) I have no reason to object to the resumed operation of the plant or the NRC inspection of Maine Yankee's submittal after the plant going critical in consideration of my present knowledge of any wrong doing associated with the allegations. In addition, Maine Yankee has assured me that the contents of the submittal have been discussed extensively by telephone with the NRC staff, and the NRC will have the document for review prior to Maine Yankee reaching reactor criticality.

Round the clock NRC Inspectors

Just prior to criticality, NRC is arranging to have round-the-clock coverage of the plant. The two on-sight NRC inspectors will be supplemented with additional inspectors to assure the plant is under continuous observation by the NRC. The round-the-clock coverage is expected to continue just beyond phase-on to 15 to 20 percent power.

Maine Yankee is meeting NRC regulations

The bases of safe operation of a nuclear power plant is that it is operating in accordance with NRC regulations. To the best of my knowledge Maine Yankee is operating in accordance with regulations, and therefore I have no reason or bases to object to the resumption of the Maine Yankee operation.

Reactor coolant flow rate verified

Prior to the start-up of Maine Yankee, the nuclear side of the plant is brought to full temperature and pressure. During this heat-up phase the operation of system components is verified, including the reactor flow rate which must be a minimum of 360,000 gallons/min. Maine Yankee empirically verified that the sleeving of the steam generators resulted in an acceptable flow rate of 376,000 gallons/min.

FINAL RESOLUTION
THE CSG/ERC NORTHEAST HIGH-LEVEL RADIOACTIVE WASTE TRANSPORTATION TASK FORCE

Preamble: *This resolution was introduced at the Task Force meeting on October 20, 1995 in Boston, MA. The resolution was subsequently passed unanimously by the Task Force via teleconferencing. The Task Force represents the states of Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania and Vermont, and consists of members appointed by the Governors of each state representing the disciplines of emergency management, radiological health physics, and energy policy analysis.*

(1) **WHEREAS**, the Nuclear Waste Policy Act of 1982 and the Nuclear Waste Policy Act Amendments of 1987 authorize the creation of a comprehensive system to manage and dispose of this country's spent nuclear fuel and high-level radioactive waste; and

(2) **WHEREAS**, such an integrated spent fuel management system would include at least four essential components:

- a central facility for interim storage until a permanent repository is ready;
- a transportation infrastructure for the transfer of spent fuel;
- a waste packaging system that integrates all elements of the program;
- a central repository for permanent deep geological disposal; and

(3) **WHEREAS**, there has been interest among certain stakeholders regarding the risk of spent nuclear fuel transportation, resulting in a position from these stakeholders that long-term or indefinite storage of spent nuclear fuel at nuclear power plant sites is preferred over transportation to a central interim storage facility; and

(4) **WHEREAS**, over the last fifteen years 1,154 shipments of commercial spent nuclear fuel have traveled over the region's highways and 128 shipments have traveled over the region's rail lines without radiation injury or contamination; and

(5) **WHEREAS**, legislation is proposed in Congress which would create a central interim storage facility for spent nuclear fuel which, if enacted, would enable an estimated 15,000 shipments of spent nuclear fuel over the next forty years, **approximately four times** the shipment frequency of the last fifteen years; and

(6) **WHEREAS**, when compared to the transportation system for hazardous materials, such as propane, acids, and other dangerous chemicals, the transportation system for spent nuclear fuel is the only one specifically engineered, designed and tested to survive hypothetical, catastrophic transportation accidents and remain intact; and

(7) **WHEREAS**, 1.5 million loads of hazardous waste are shipped by rail each year, and many more shipments by trucks which, in the case of an incident, may have more severe consequences to the public's health and safety than a similar incident with spent nuclear fuel or high-level radioactive waste; and

(8) **WHEREAS**, the Department of Energy is in the process of establishing the transportation infrastructure, which is the critical link between the current system between on-site storage and the permanent disposal facility; and

(9) **WHEREAS**, critical elements of the DOE transportation program have been successfully tested recently with highly toxic and radioactive waste shipments, including:

- cesium from the state of Colorado to Washington;
- radioactive nitric acid from Washington to Portsmouth, VA; and
- in simulated shipments to the Waste Isolation Pilot Project in New Mexico; and

(10) **WHEREAS**, states in the Northeast have had many years of experience in transporting a wide variety of hazardous and radioactive materials and waste products and have developed and implemented safety and emergency preparedness programs and response regulatory programs for these shipments; and

(11) **WHEREAS**, the basis for the establishment of nuclear power plants at sites within the various states has always been that spent nuclear fuel would be transported from the sites;

(A) **NOW, THEREFORE BE IT RESOLVED**, that the Northeast High-Level Radioactive Waste Transportation Task Force reaffirms its support for DOE's efforts to establish a comprehensive infrastructure for the transportation of spent nuclear fuel; and

(B) **BE IT FURTHER RESOLVED**, that the Northeast High-Level Radioactive Waste Transportation Task Force believes that spent nuclear fuel transportation on a scale of four times or more greater than past practices is an important issue which can be handled effectively with prior planning, training and implementation of procedures for routine safe transportation and emergency management; and

(C) **BE IT FURTHER RESOLVED**, that the Northeast High-Level Radioactive Waste Transportation Task Force has confidence that with proper prior employment of planning, training and implementation of procedures for routine safe transportation and emergency management, public health and safety and the environment can be protected such that the risk of transportation of spent nuclear fuel should not be an impediment for the establishment of a central interim storage facility.