# Report
# of the
# State Nuclear Safety Advisor
# submitted to the
# Governor and 120th Legislature
# As of January 15, 2001

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## INTRODUCTION AND EXECUTIVE SUMMARY

This annual report of the State Nuclear Safety Advisor to Maine's Governor and legislature documents events of the past year and anticipates coming issues concerning the safe storage, transport and disposition of nuclear materials. In Maine, the duty to report has traditionally focused on radiated materials and the activity of Maine Yankee Atomic Power Company (Maine Yankee or MY) in Wiscasset. During 2000, Maine Yankee concluded year three of its seven-year decommissioning of its facility. Section I outlines the significant events of Maine Yankee's decommissioning for the year 2000 and notes key issues for 2001.

Although Maine Yankee is the focus for state activity because it is the prime generator of radioactive materials, other facilities are also engaged in nuclear energy activity. **Section II discusses Portsmouth Naval Shipyard (PNS),** now in its 201$^{st}$ year, as the shipyard transitions from growth to maintenance in the federal nuclear propulsion program as evidenced by increasing privatization efforts underway on Seavey Island.

Low-level radioactive waste is the material most common in Maine and elsewhere. It is generated in significant quantity when a facility undergoes decontamination and dismantlement (D & D). In addition, Maine has a stable and continuous stream generated by hospitals, research labs and small industry that must be shipped out of state. A traditional disposal facility for Maine is in Barnwell, South Carolina (Barnwell). South Carolina joined the Atlantic Compact in early 2000. The change means that in seven years, Barnwell will no longer accept waste from 49 states, but only two in addition to South Carolina. Maine's disposal choices for the near term are Barnwell and Envirocare of Utah. As a member of a Compact that has no facility in the host state of Texas, Maine's option has changed both in terms of the Compact's usefulness and economics.

The fate of the Texas Compact (member states Texas, Maine and Vermont) may be decided in the Texas legislature this year. **Section III addresses the low level radioactive waste situation in Maine in the context of developing events in South Carolina and Texas.**

High-level waste radioactive waste is present in Maine in small quantities as medical and industrial waste and in large quantity as spent nuclear fuel (SNF) from the Maine Yankee facility and PNS. The SNF from PNS is currently loaded into a SNF wet pool in a railcar directly from a nuclear submarine and shipped to Idaho National Engineering and Environmental Laboratory (INEEL). The SNF from Maine Yankee is greater in bulk and in enrichment than military SNF. MY proposes to load SNF from its 'wet pool' into dry storage/transport casks beginning in May at the on-site Independent Spent Fuel Storage Installation (ISFSI, pronounced "is-FISS-ee"). **Section IV describes dry cask storage of spent fuel and touches on options available to the utility due to uncertainties for federal disposal of SNF**. Maine is engaged with the federal oversight agencies in an ongoing basis, particularly the Nuclear Regulatory Commission (NRC) and the Department of Energy (DOE), concerning federal duties owed to the State. MY continues, in cooperation with Yankee Rowe in Massachusetts and Connecticut Yankee in Connecticut, to pursue money damages from DOE for DOE's failure to timely provide either interim storage or permanent disposal for SNF. Maine, Connecticut and Massachusetts, three states with shutdown plants, are in the position of leading the nation in storing SNF on site. NRC criteria for state interim storage sites is used yet these sites lack the same analysis and safeguards provided federal interim storage sites such as the one at INEEL. Safety issues relevant to the State for the MY ISFSI are not addressed in the report although some activity by Maine Yankee took place in 2000 in the form of filings with the NRC. Safety and State response issues on the ISFSI will be addressed as appropriate in the 2001 report.

The DOE is actively working on the issues that surround increased transportation of radioactive material. Preparation, training and copious public information are key **Transport routes and safety response issues are addressed in Section V.**

If SNF is to move out of Maine, it must move somewhere. The timing of Yucca Mountain approval as the federal repository is such that the private sector continues to search for interim storage sites. Movement of Maine Yankee's spent fuel and fresh fuel movement by air through the state are first impression issues for Maine. **Section VI briefly addresses shipments of high-level radioactive material.**

**Section VII is a summary outline of the status of federal and state proceedings** now pending or concluded during 2000. This section primarily identifies the case or proceeding by title and outlines procedural history or outcome.

SECTION I

## Background

Maine Yankee, Maine's only nuclear power plant, is being dismantled and the plant site being restored for another use. Located on Montsweag Bay in Wiscasset, Maine Yankee was the State's largest generator of electricity for 25 years. The Plant was officially closed in August 1997. After Maine Yankee closed in 1997, it began to be decontaminated and dismantled (D&D). This is essentially "construction in reverse". It includes four steps:

- preparation and planning;
- removal and disposal of radioactive equipment and materials;
- cleanup of residual radioactivity on the site
- restoration of the site for another use.

Maine Yankee plans to finish decommissioning in 2004. Currently, the Maine Yankee site looks much the same as it did when the plant was operating.

However, visible physical change is underway with the dismantlement of buildings such as the spare generator building, the fuel oil building, the guard towers, gas house, warehouse #5 and three large above ground tanks.

**Significant Events in 2000**

There were three significant events and one notable one from the State's viewpoint that occurred during this third year of Maine Yankee D&D. The first significant event was the successful shipment of three steam generators and a pressurizer to a licensed disposal facility in Barnwell, South Carolina; the second was the termination of services of Stone and Webster to oversee D&D; and the third was commencement of segmentation of the reactor core internals, the most highly radioactive component on site.

A. Shipment of the steam generators to GTS Duratek in Tennessee

A barge carrying Maine Yankee's two steam generators left Maine via the Sheepscot River on June 13 and arrived in Memphis, TN later that month. The third steam generator and the pressurizer departed on June 28 and arrived in mid-July at the Port of Memphis facility. The trip was approximately 2,750 miles and was uneventful. GTS Durateck is processing the three steam generators and pressurizer to separate the radiologically contaminated metal from the clean. The clean metal is eligible for recycling.

B. Stone and Webster termination

In May, concern over Stone & Webster's weakening financial condition resulted in a MY termination of the Decommissioning Operations Contractor (DOC) contract with Stone and Webster. Shortly thereafter Stone and Webster filed for Chapter 11 bankruptcy protection. Maine Yankee engaged most of the Stone and Webster subcontractors and assumed the DOC role. Maine Yankee subsequently issued a request for proposals for a new DOC but has not made a decision by year's end from among the three finalist companies submitting proposals. The finalists are 1) Stone and Webster (now owned by The Shaw Group), 2) a joint venture of British Nuclear Fuels Limited (BNFL) and the

Washington Group, and 3) CH2MHill. The continuation of MY as the DOC is a fourth option under active consideration. The decision, scheduled for late January, will be made primarily on the ability of MY to distribute business risk in proportion to new contractual costs incurred.

C. Segmentation of the reactor core internals

The third significant event in 2000 was commencement of the cutting of the reactor vessel internals into segments to remove Greater Than Class C (GTCC) waste. The operation will continue through the first part of the year. The non-GTCC waste is placed back in the reactor vessel to be shipped as a single package for disposal at Barnwell. The operation requires remote control high precision cuts employing abrasive water jet technology to dismantle the reactor internals while it is submerged in a water vault. The water operation prevents the material that results from the segmentation procedures from becoming airborne and creates a radiation shield for workers who guide the demolition process. Due to a low water table in the Savannah River, the shipment of the reactor vessel to the proposed disposal site in Barnwell is uncertain. Some byproduct of the reactor internals dismantling will be stored in four dry casks as GTCC waste. The future disposal of GTCC is problematic under the federal scheme of waste disposal. Although plans for SNF disposal are controversial and thwarted in their implementation, considerable planning and testing has occurred. The DOE has yet to begin plans or protocols for GTCC waste storage or disposal. The DOE delay is cause for some concern to Maine Yankee because they need certainty now on how to package the GTCC waste for ultimate DOE acceptance and transport. The State is adversely affected in that federal authority governs licensed nuclear material but there is a void of federal responsibility. State regulators and policy makers have little to no guidance regarding how to manage the highly toxic radioactive GTCC material that may be stored in the state for years to come.

D. Other

Maine Yankee voluntarily ceased operation (typically referenced by MY personnel in the military vernacular as a "stand down") for one week in October. This notable event was one of five stand-downs in 2000. Prior stand downs related to industrial safety. The October stand down was due to loss of control over radioactive material and resulted from movement of a supposedly clean storage container from the radioactive side of the plant ("hot side") to the clean side ("cold side") for a welding operation. Five workers involved in the welding procedure left the plant with radioactive material on their clothing, but no spread of nuclides was detected on their person or at the one home whose family requested State inspection. Maine Yankee inspected several homes of the workers involved and only one family accepted the offer for follow up inspection by the State. MY filed a report with the NRC citing radiation protection personnel problems as the root cause of the radiation protection failure. As corrective actions, MY required radiation protection technicians to demonstrate their skills and knowledge in a written exam, gave supervisors new protocols to follow including explicit approval for movement of any material from the hot side of the plant, required senior management to oversee field operations periodically and hired additional technicians. The event was serious and treated as such by MY who voluntarily stopped D&D, took swift, appropriate action and communicated fully with the State during the event.

**Significant Events Scheduled in 2001**

Five significant events are scheduled for 2001. The first, in order of significance, is the loading of spent nuclear fuel from the wet pool into dry casks for storage and eventual transport. Maine Yankee purchased dual-purpose storage/transport casks for which they receive a 20-year NRC license. The loading is scheduled to begin in May 2001 and conclude in twelve months.GTCC waste will be loaded into dry casks prior to SNF. The schedule to load GTCC has

slipped from December to February so that the schedule for SNF may also be delayed.

The second significant event is the loading of the segmented reactor internals into the reactor vessel for shipment offsite. MY plans to barge the reactor vessel up the Savannah River to Barnwell. The Savannah River, however, is experiencing low water levels due to extended drought conditions. The contract with Savannah River gives MY until May 2002 to deliver the packaged vessel. Maine Yankee is currently examining additional options under the assumption the river will not have water at the levels required to support barge transport.

Third, demolition of several buildings on site is scheduled. Although demolition lacks the significant hazards of the SNF and reactor core internals, demolition debris is a large volume of the project. Nuclear or 'hot' side concrete will be shipped to a private low-level radioactive waste disposal in Utah, managed by Envirocare. For uncontaminated concrete, out of state disposal sites will be used. Once the bulk of concrete leaves the site, the necessity for the State's participation in the Texas Compact comes under renewed scrutiny. MY has an inchoate liability of $27.5 million under the state's continued participation in the Compact. The liability could become due once Texas approves a site.

The fourth significant planned event is MY's proposed petition to the NRC by summer for a Part 50 license amendment. The amendment seeking authorization for partial site release of the 200 acres on what is known as the Eaton Farm has been submitted. A second amendment request for another 450 acres of the Ferry Road North industrial site will follow later this year. The partial release of the bulk of the site from NRC oversight means both the NRC and the state are satisfied with the restoration efforts according to federal standards. In addition, there are state standards to meet including Maine Yankee's non-nuclear clean up responsibilities under the Resource Conservation and Recovery Act (RCRA). Oversight of RCRA is through Maine's DEP and the federal

Environmental Protection Agency (EPA). After partial site release, the company has approximately 170 acres on which it will continue the D&D process.

Finally, the revised License Termination Plan (LTP) will be submitted to the NRC in April. The State through its oversight agencies, the Nuclear Inspector and this office, has pressed Maine Yankee to be more specific and detailed in the final LTP than in its draft LTP. The State has asked an NRC panel of judges to monitor MY's submission schedule and to decide any 'contentions' the State may raise once the Plan is finally submitted. An LTP is the key means for State and local community members to communicate with the NRC about the methods and effects of plant closure. Once the federal NRC license is terminated, the company is no longer regulated by the NRC. RCRA requirements must then be met. Assuming the Plan is accepted, the soonest the NRC Part 50 license will terminate is 2004. Maine Yankee has indicated that it may try to operate the ISFSI under the more liberal Part 50 license guidelines by shrinking the licensed area to the ISFSI site. If that happens, the estimated termination date of the Part 50 license becomes less clear, but presumably follows a separate process for the ISFSI D&D.

SECTION II

**Portsmouth Naval Shipyard**

Portsmouth Naval Shipyard (PNS) celebrated its bicentennial in 2000. During the open house celebration held June 10 and 11, the Shipyard hosted more than 100,000 people. Members of the surrounding community had the opportunity to see the Shipyard's industrial facilities and talk to the workforce, visit several historic homes, walk the historical trail, and tour U.S. Coast Guard Cutter Reliance, home ported at the Shipyard.

The USS MAINE (SSBN 741), an Ohio Class ballistic missile submarine commissioned at the Shipyard in 1995, returned to participate in the special celebration and hosted over 10,000 visitors during the weekend.

In March, the Naval Nuclear Propulsion program issued Report NT-00-1 entitled "Environmental Monitoring and Disposal of Radioactive Wastes from U.S. Naval Nuclear-powered Ships and their Support Facilities." According to the report, most shipments of radioactive waste and materials are classified as low level or "limited quantity." The predominant radionuclide is cobalt 60. Most low-level shipment is by truck although air transport is occasionally used. PNS ships spent nuclear fuel by rail. SNF shipments are less frequent than other materials because the Navy has extended the life of the fuel rods used in the submarines such that only one refueling is used during a sub's service life (approximately 30 years). Since 1957, all SNF has been shipped via rail to the Idaho lab, INEEL. U.S. government representatives escort each SNF shipment and each shipping container is specifically designed to withstand extreme accident impacts, to withstand fire and water immersion, and to prevent release of the material to the environment in the event of an accident. Until 1992, the fuel was reprocessed to recover the unused uranium. In 1992, reprocessing terminated and SNF was sent to INEEL for interim storage. As a part of the agreement among the State of Idaho, the Navy and the Department of Energy (the so-called Batt Agreement after then Governor Batt), PNS may continue to ship SNF to INEEL until 2035 or until a permanent geologic repository or central interim storage facility is opened.

The Naval Nuclear Propulsion Program estimates that its nationwide shipments of SNF expose the general population on average to a radiation dose of "3 person-rem" annually. This dose total is from the 719 container shipments of SNF made over a 42-year period through the end of 1999. This dosage is considered to be a negligible amount and reflects estimates made based on rail transport. Only a fraction of these shipments originated at PNS. The tracks at Kittery are the only rail lines in Maine that currently move SNF or are capable of supporting the load of a SNF transport cask. PNS may construct an ISFSI at INEEL for interim storage of SNF in the near future.

Also this year, the State of New Hampshire brought suit against Maine in the U.S. Supreme Court to renew a dispute over the river boundary between the

two states. The complaint claims that the Shipyard islands belong to the State of New Hampshire. The Navy's official position is neutral. Recently, business interests began moving to Seavey Island. PNS leased one of its larger buildings for development this year and has several more buildings advertised for exclusive and dual use leases. The boundary dispute is not resolved, but the State of Maine's motion to dismiss on grounds of *res judicata* is pending before the Supreme Court.

SECTION III

**The Texas Compact**

Arrangements between and among Maine, Vermont and Texas to dispose of low level radioactive waste generated in their states led to a Compact originally negotiated in 1993. The Compact, hereafter the Texas Compact, is authorized by the Low Level Radioactive Waste Policy Act Amendments to the Atomic Energy Act of 1954 (42 USC § 2011 *et seq.*). Changes since the 1993 arrangement include the following:

1) the May 1997 decision of Maine Yankee's owners to accelerate by ten years the shutdown and decommissioning of that 855 megawatt unit;

2) the October 1998 decision of the Texas Natural Resource Conservation Commission (TNRCC) to reject the license application for the Faskin Ranch site in Sierra Blanca, as submitted by the Texas Low-Level Radioactive Waste Disposal Authority (TLLRWDA) in 1996;

3) the decision in the Texas Legislature in 1999 to abolish the TLLRWDA and transfer its functions to the TNRCC;

4) the absence of any appointments to the Texas Low-Level Waste Disposal Compact Commission to fill the six seats reserved for the interests of Texas and the host county; and

5) increasing interest on the part of the TNRCC, the Legislature and Texas' Attorney General in evaluating the merits of Assured Isolation in lieu of (or prior to) constructing a permanent disposal facility in Texas.

As a result of these changed circumstances, this office notified interested Texas parties in a letter dated October 17, 2000 that Maine invited Texas "to consider adjusting the expectations underlying the Compact and to undertake a forthright evaluation of potential alternatives." Such an evaluation was undertaken once before in the form of the September 1997 letter agreement (i.e. executive agreement) among and between Governor Bush, Governor King and Governor Dean that sought to clarify the intent of the Compact legislation. Both Vermont and Maine have engaged legal counsel in Texas to represent their interests before the Texas legislature and executive branches in 2001.

Maine's current position on the Texas Compact is that Maine confronts a circumstance that was unanticipated during the Texas Compact negotiations in Austin and the ratification of the Compact in Washington. That circumstance is the virtual elimination of any waste stream from Maine requiring disposal at a Texas facility. Such a curtailment is the result of Maine Yankee's decommissioning (now 40% complete) with associated shipment of low-level waste to licensed facilities in Utah and South Carolina. As was anticipated in part by the Rogers and Associates Engineering "Technical Report on Radioactive Waste Generation Trends and Management Alternatives" of August 2000, Maine Yankee's contribution to the waste stream destined for a Compact facility will be substantially reduced, if not outright eliminated (RAE Study, "Technical Report," p. 4-30, p. 4-106, p. 4-109, 8/00). The expectation is that the 1,016,000 cubic foot total of decommissioning waste from Maine Yankee identified in the Rogers and Associates' Technical Report will find disposal at a Utah or South Carolina facility prior to the scheduled completion of Maine Yankee's decommissioning. Apart from Maine Yankee's waste volumes, low-level waste requiring disposal from all other waste generators in the State is insignificant, ranging from 1,054

cubic feet to 1,421 cubic feet annually over the 1996 to 1999 period according to records maintained by Maine's Department of Human Services, Division of Health Engineering.

**Barnwell, South Carolina**

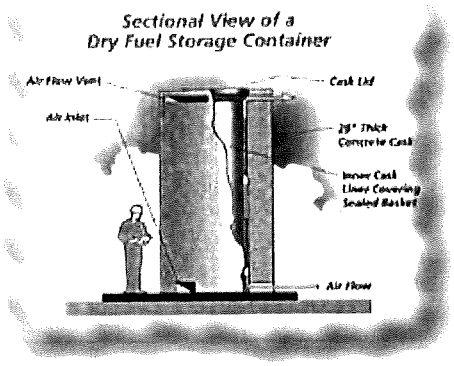
In June, South Carolina was admitted into the Atlantic Compact. That state's decision to join a compact served to convert its Barnwell facility from a commercial waste disposal site into a dedicated facility for three compact states: South Carolina, New Jersey and Connecticut. The decision by the formerly named Northeast Compact to admit South Carolina allows Connecticut and New Jersey to continue to send their low-level radioactive waste (LLRW) out of state. At the same time, the agreement allows South Caroline to eventually exclude other states from sending LLRW to the Barnwell facility. The facility will remain open commercially for a phase-out period, estimated at seven years.

SECTION IV

**Independent Spent Fuel Storage Facilities (ISFSI)**

Since it began operation in 1972, Maine Yankee produced 1,434 used nuclear fuel assemblies. The disposal of the spent fuel assemblies is the responsibility of the Department of Energy. Unless and until the DOE accepts and transports the SNF, many nuclear plants around the country are storing used fuel in steel and concrete containers. These containers are placed on a concrete pad. Maine Yankee estimates it needs 64 containers to house its used fuel and GTCC waste. Each container, part of a dual-purpose (storage/transport) system manufactured by NAC International of Atlanta, GA, holds 24 assemblies of used fuel. After used fuel is removed from operation, it begins to quickly lose heat and radioactivity. Fuel that has been out of operation for five years or longer can be placed in dry storage. In Maine Yankee's case, the fuel will have been cooling for

placed in dry storage. In Maine Yankee's case, the fuel will have been cooling for a minimum of six years before transfer to the dry storage facility. Dry storage is preferred by many utilities over wet storage because it is more economical if the used nuclear fuel remains on-site for many years. As a passive, air cooled system, it requires less maintenance and fewer support staff. Additionally, it was originally MY's belief that moving the fuel to dry storage would allow the plant to be completely decommissioned, although the ISFSI requires a separate decommissioning. The second decommissioning may turn out to be as complex for both MY and the State as the plant D&D if the DOE continues to stall on its statutory duty to remove SNF. MY, along with utilities Connecticut Yankee and Yankee Rowe, won a significant court battle in the summer when a federal judge ruled that the DOE breached its contract with the utilities to remove the SNF by 1998. The case will proceed on a money damages basis over the next two years. Both wet and dry storage are regulated by the U.S. Nuclear Regulatory Commission and require an approved security system and on going monitoring, which are part of the damages to be calculated.




Currently, U.S. federal policy distinguishes between civilian and military SNF for purposes of transport and storage. DOE clean up waste, such as the SNF at West Valley in New York State and naval SNF is shipped via rail to Idaho for interim storage. New York's Brookhaven National Lab will also begin to ship SNF out of New York via rail within the year. Interim storage of SNF for shut down commercial plants remains an enigma, however. Although dry casks are a safe short term SNF storage solution, no state, including Maine, is prepared to manage the consequences of SNF interim storage in the same way as DOE manages military, foreign and research reactor SNF. Some private solutions have been proposed and will likely be expensive. The global market may also

England and France also provide options for reprocessing SNF to reduce the quantity of radioactive waste. The current wait for reprocessing in England is approximately 10 years but shipment is immediately available. Interim storage is provided during the queue period for reprocessing.

SECTION V

## Transportation Routes

In the State of Maine, the Turnpike, I-95 and its by-passes and Route 1 are the primary corridors for the transportation of radioactive material such as those used at hospitals from York to Fort Kent. Portable gauges, such as lead in paint analyzers, moisture density gauges, and asphalt content gauges travel to wherever they are needed, on road and off road. With the decommissioning of Maine Yankee there has been an increase in the amount of low-level radioactive waste (LLRW) being transported on Maine's roads and highways. MY has already shipped more than 9 million pounds of LLRW during the current decommissioning. One route of travel for LLRW is Route 1 from MY in Wiscasset to I-95 via Brunswick-Topsham by-pass in Topsham and getting on the Maine Turnpike via the Falmouth access and continuing on the turnpike to the Maine-New Hampshire border. Rail shipments are also ongoing.

LLRW is shipped to the disposal facilities by ground transportation, regulated by the U.S. DOT under 49 CFR Parts 100-179. In the rare occurrence of a transportation accident involving LLRW, the Federal Emergency Management Agency, along with eleven other agencies, has established an emergency response plan. The DOT regulations address third-party bodily injury and property damage and cleanup. They require minimum limits for insurance per occurrence. All transporters of LLRW must comply with the Motor Carrier Act of 1980.

**Incident Response**

Response to an incident or accident involving radioactive material would follow the established protocol for response to any incident/accident involving any type of hazardous material. Once the hazard is identified, appropriate action and notification is implemented in accordance with established EPA guidelines. In addition to these guidelines, Ret. Col. Art Cleaves at the Maine Emergency Management Agency (MEMA) has incorporated into the State's Comprehensive Emergency Management Plan under the Radiological Protection Annex the Radiological Transportation Accidents Appendix. This appendix, available at MEMA, establishes the guidelines for state and local level response to a transportation accident involving radioactive material. Mike Grant at MEMA and Wayne Malloch at BHE (and formerly at MEMA) are two of the state's network of personnel who are trained and have trained local teams to respond to incidents and accidents involving nuclear material.

The Occupational Safety and Health Administration (OSHA) and the National Fire Protection Association (NFPA) have established guidelines for hazardous material response training. The Federal Emergency Management Agency and the U.S. Department of Transportation have co-developed the Hazardous Materials Emergency Preparedness (HMEP) Grant program to provide grants for hazardous material response planning and training. Training is at three levels – awareness, operations and technician. Volunteer fire departments in Maine receive the Awareness level training. Full time Fire Departments are trained to the Operations level with some personnel trained to the Hazardous Materials Technician level. Fire Chief Gary Howard in Brunswick heads one of Maine's best equipped and trained 'hazmat' and radiation incident teams. Refresher training is done annually. In 2000, Maine joined New Hampshire and Massachusetts teams for a major six-year incident exercise at the Seabrook Nuclear Power plant in June. The Federal Emergency Management Agency (FEMA) conducted an exercise in the Plume and Ingestion

Exposure Pathway around Seabrook Station. Results of the exercise were: no Deficiencies and forty-five Areas Requiring Corrective Action (ARCA). The State is also on call to respond to incidents occurring at the nuclear power plant at Point Lepreau near St. John, New Brunswick, Canada.

SECTION VI

**Shipments**

In addition to the aforementioned routinely shipped LLRW and PNS shipments of SNF via rail from Kittery, labs, hospitals and radiological medical supply houses or pharmacies transport small volumes nuclear material or high level and low level waste through and around the State daily (Augusta has a nuclear pharmacy, for example, that transports radiated medical supplies to hospitals all over the State). These shipments are common to most states and are analyzed and prepared for by responder teams. A more unusual shipment through Maine this year is under analysis and consideration by MEMA and this office. One shipment of new fuel (not irradiated) for a foreign reactor in the Czech Republic was air freighted through the state via Bangor International Airport (BIA) in late 2000 and another is scheduled in early 2001. The Westinghouse/BNFL Corporation requested permission from BIA to refuel the cargo plane, an Antonov 124. The first refueling took place in October. A second refueling is scheduled on January 31.

Although some European countries do not allow nuclear material to be flown in their airspace (France and the Netherlands), BIA can accept the flights so long as the carrier meets US Department of Transportation (DOT) insurance requirements and Federal Aviation Administration (FAA) regulations. The nature of the risk incurred is less related to the cargo (new fuel as shipped poses no radiation exposure risk) than to traditional problems associated with commercial planes and Antonovs in particular (a specialty plane with few sources for parts). During the course of 2001, various State agencies and BIA may need to assess

any special emergency training and security issues that arise with air transport of nuclear material, including assessing special and associated costs.

Section VII

**Proceedings**

As of the end of December, the State is affected by or actively involved in the following proceedings shown as concluded or pending:

***Pending:***

**Docket # 50-309-OLA/ASLBP #00-780-03-OLA**

In the Matter of Maine Yankee Atomic Power Co.

The State petitioned the NRC Licensing Board for "party status" in order to formally present comments on the Maine Yankee License Termination Plan (LTP). The status, which was granted, allows the state to submit a contention or contentions with the Plan if the State disagrees with the LTP contents. The LTP documents methods, procedures and goals for decommissioning of the Maine Yankee plant and site. Maine Yankee reported in October to the Licensing Board that a revised LTP would be submitted to the NRC in April 2001. The court will schedule time for the State to formulate any contentions after submission.

**NRC Proposed Rule**

Interim Storage for Greater Than Class C (GTCC) Waste," FR, Vol. 65, #117, Friday, 6/16/2000

The State commented that it is likely that the incremental cost of additional canisters to separate spent fuel from GTCC is small relative to the total costs associated with developing and operating a spent fuel and GTCC facility. In the State's opinion, "a substantial risk would be assumed by a licensee who combines GTCC with spent fuel given the absence of technical criteria governing what constitutes an acceptable disposal package for spent fuel or GTCC wastes." The State and Maine Yankee have also engaged in extensive

correspondence with the Department of Energy (DOE) in an attempt to gain DOE approval of the GTCC loading process to avoid future canister re-opening.

**Docket # 50-309**

NRC Review of Maine Yankee Exemption Request under 10 CFR 73.55 for Revised Security Plan

**Docket #s 99-5138, 5139, 5140**

Maine Yankee Atomic Power Company, Connecticut Yankee Atomic Power Company and Yankee Atomic Electric Company v. United States,

United States Court of Appeals for the Federal Circuit

The damage portion of the proceedings has been stayed pending resolution of how discovery may proceed most efficiently.

**Original No.130**

State of New Hampshire v. State of Maine, U.S. Supreme Court (filed in March, 2000) Boundary dispute between the states over Kittery and Portsmouth environs. New Hampshire claims Seavey, Jamaica and Clark's Islands where PNS is located. At the Supreme Court's invitation, Maine filed a motion to dismiss for *res judicata* in June. The motion is pending. In December, the U. S. Department of Justice, Solicitor General's Office, filed an *amicus* brief on Maine's behalf.

***Concluded:***

Settled January 2001

**Docket #00-1476**

State of Maine v. Nuclear Regulatory Commission and the United States, United States Court of Appeals for the District of Columbia Circuit

State's action seeking a Petition for Emergency Stay of the NRC rule approving the NAC-UMS spent fuel storage system was settled when the NRC agreed to

send a letter to the DOE requesting formal comment on the dual purpose storage/transport canister that will be used for dry cask storage of Maine Yankee's spent fuel.

Decided August 31, 2000

**Docket #s 99-5138, 5139, 5140**

Maine Yankee Atomic Power Company, Connecticut Yankee Atomic Power Company and Yankee Atomic Electric Company v. United States,

United States Court of Appeals for the Federal Circuit

The Appellate Court affirmed the United States Court of Federal Claims decision that the three utilities may maintain a damage suit based on the government's breach of a 1983 contract by which DOE was to begin disposing of nuclear waste as of January 1, 1998. The United States and the DOE failed to persuade the court that the proper procedure for the utilities was to file an administrative claim with the contracting officer under the contract's dispute provision.

Decided August 22, 2000

**Docket P-99-CA-062**

Hudspeth County, TX v. State of Maine and State of Vermont, United States District Court for the Western District of Texas (Pecos Division)

Sr. District Judge Lucius Bunton dismissed a claim by Hudspeth County for $1.25 million due from each defendant state under the Texas Compact. The court held that the Eleventh Amendment barred the action as a matter of law (neither State waived sovereign immunity regarding Hudspeth's claims).

Decided May 8, 2000

**Docket No. 99-CV-279**

Maine Yankee Atomic Power Company v. Osmond Bonsey, Chair of the Board of Environmental Protection and Martha Kirkpatrick, Commissioner, Maine Department of Environmental Protection, United States District Court in the District of Maine

MY sought declaration that the BEP/DEP's regulation of its decommissioning activities was preempted by federal law. On MY's motion for summary judgment, state's motion to dismiss, and environmental organization's motion to intervene, the District Court (Judge Steven J. McAuliffe sitting by designation) held that: (1) dispute was ripe for adjudication; (2) state's regulatory authority was limited to non-nuclear aspects of MY's conduct; and (3) environmental organization (Friends of the Coast) would not be permitted to intervene

***State Legislation in 2000***

Signed April 26, 2000

SP 955-LD 2496/Chapter 739

"radioactive materials" monitoring defined to include vehicles for transport

SP 1084-LD 2688/Chapter 741

"Low-level radioactive waste" definition does not include radioactive material meeting a standard of total effective dose equivalent of 10 (or less) millirems all pathways including 4 m/r in groundwater sources of drinking water

## Conclusion

The year 2000 was an active prelude to an even more eventful year 2001 for Maine Yankee decommissioning. Whether a new Decommissioning Operation Contractor will be hired or Maine Yankee will be its own DOC, whether or not a majority of the land for the MY site will be released for new uses, whether or how federal oversight agencies will demonstrate responsibility for MY spent fuel and greater than class C waste, whether public response to an increase in the transport of nuclear waste and materials in Maine will change in any way were prominent issues in 2000 and will continue to require the State's attention in 2001. The position of Maine as a forerunner in large scale dry cask spent fuel interim storage requires the persistent pursuit of answers on both the national and international fronts for how hosting governments manage this tremendous responsibility on behalf of its citizenry.

Maine Yankee's operation has ended. Maine's challenge with regard to operating nuclear facilities will be to retain requisite expertise for responsibilities, primarily emergency response, attendant to proximity to Seabrook Power Plant in New Hampshire and Point Lepreau in New Brunswick. The dynamics of the nuclear industry—whether private sector partnerships at PNS, new fuel shipments through BIA or clean up efforts at MY—continue to affect both Maine commerce and her citizens.

**Resources and References**

The State and Maine Yankee have excellent web pages with facts and images on decommissioning of the Maine Yankee Atomic Power Plant: and radiation control and management

http://janus.state.me.us/dep/rwm/myankee/homepage.shtm

http://janus.state.me.us/dhs/eng/rad/rad.shtm

http://www.maineyankee.com/

Prior year Nuclear Safety Advisor Reports are cataloged and on file in the Legislative Law Library.

**Acknowledgements and Errata**: I wish to thank staff at Portsmouth Naval Shipyard, Maine Yankee, the State's Office of Nuclear Safety and Division of Health Engineering for assistance in preparation of this report. Any errors are my responsibility, however. If readers note errors or have comments on the information presented in this report, kindly send your comments via email to paula.craighead@state.me.us or write to State Nuclear Safety Advisor, St. Hs. St. 38, Augusta, ME 04333. If appropriate, an addendum will be published either in advance of or with the 2001 Report.

## GLOSSARY

Excerpts from the 1996 DOE publication *Closing the Circle on the Splitting of the Atom*

**Alpha particle**. A particle consisting of two protons and two neutrons, given off by the *decay of* many elements, including uranium, plutonium, and *radon.* Alpha particles cannot penetrate a sheet of paper. However, alpha emitting isotopes in the body can be very damaging.

**Atom**. The basic component of all matter. The atom is the smallest part of an element that has all of the chemical properties of that element. Atoms consist of a *nucleus* of protons and *neutrons* surrounded by electrons.

**Beta particle**. A particle emitted in the *radioactive decay of* many *radionuclides. A* beta particle is identical with an electron. It has a short range in air and a low ability to penetrate other materials.

**Calcine**. A process that uses heat to reduce liquid high-level waste into a dry, powdery form. Also the powdered waste that results from this process.

**Cesium.** An element chemically similar to calcium. Isotope cesium-137 is one of the most important *fission products,* with a *half-life* of about 30 years.

**Chain reaction.** A self-sustaining series of nuclear fission reactions, *when neutrons* liberated by fission cause more fission. Chain reactions are essential to the functioning of *nuclear reactors* and weapons.

**Chemical separation.** Also known as *reprocessing;* a process for extracting *uranium* and plutonium from dissolved irradiated targets *and spent nuclear fuel* and *irradiated targets.* The fission products that are left behind are *high level wastes.*

**Cladding.** The outer layer of metal over the fissile material of a nuclear fuel *element.* Cladding on the Department of Energy's *spent fuel* is usually aluminum or zirconium.

**Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).** A Federal law, enacted in 1980, that governs the cleanup of hazardous, toxic, and radioactive substances. The Act and its amendments created a trust fund, commonly known as Superfund, to finance the investigation and cleanup of abandoned and uncontrolled hazardous waste sites.

**Criticality.** A term describing the conditions necessary for a sustained nuclear *chain reaction.*

**Curie.** The amount of radioactivity in 1 gram of the *isotope* radium 226. One curie is 37 billion *radioactive decays* per second.

**Decay (radioactive).** Spontaneous disintegration of the *nucleus* of an unstable *atom,* resulting in the emission of particles and energy.

**Decay product.** The *isotope* that results from the *decay* of an unstable *atom.*

**Decommissioning.** Retirement of a nuclear facility, including *decontamination* and/or dismantlement.

**Decontamination.** Removal of unwanted radioactive or hazardous contamination by a chemical or mechanical process.

**Defense Waste Processing Facility.** A *high-level-waste vitrification* plant built at the *Savannah River Site.*

**Department of Energy (DOE).** The cabinet-level U.S. Government agency responsible for nuclear weapons production and energy research and the cleanup of hazardous and radioactive waste at its sites. It was created from the *Energy Research and Development Administration* and other Federal Government functions in 1977.

**Depleted uranium.** *Uranium* that, through the process of *enrichment,* has been stripped of most of the *uranium 235* it once contained, so that it has more *uranium 238* than *natural uranium.* It is used in some parts of nuclear weapons and as a raw material for *plutonium* production.

**Deuterium.** A naturally occurring *isotope* of *hydrogen.* Deuterium is lighter than *tritium,* but twice as heavy as ordinary hydrogen. Deuterium is most often found in the form of *heavy water*

**Dose.** As used here, a specific amount of *ionizing radiation* or toxic substance absorbed by a living being.

**Dry cask storage.** The storage of *spent nuclear fuel* without keeping it immersed in water.

**Enrichment.** The process of separating the *isotopes* of *uranium* from each other. Other elements can also be enriched. In the United States this is done using the *gaseous diffusion* process.

**Enriched uranium.** *Uranium* that, as a result of the process of *enrichment,* has more *uranium 235* than natural uranium.

**Environmental contamination.** The release into the environment of *radioactive,* hazardous and toxic materials.

**Environmental Management.** An Office of the *Department of Energy* that was created in 1989 to oversee the Department's waste management and environmental cleanup efforts. Originally called the Office of Environmental Restoration and Waste Management, it was renamed in 1993. Often abbreviated EM.

**Environmental Protection Agency.** A Federal agency responsible for enforcing environmental laws, including the *Resource Conservation and Recovery Act;* the *Comprehensive Environmental Response, Compensation and Liability Act;* and the Toxic *Substances Control Act.* The Environmental Protection Agency was established in 1970.

**Fissile.** Capable of being split by a low-energy *neutron.* The most common fissile *isotopes* are *uranium 235* and *plutonium 239.*

**Fission.** The splitting or breaking apart of the *nucleus* of a heavy *atom* like *uranium* or *plutonium,* usually caused by the absorption of a *neutron.* Large amounts of energy and one or more *neutrons* are released when an atom fissions.

**Fission products.** The large variety of smaller atoms, including cesium and *strontium,* left over by the splitting of *uranium* and plutonium. Most of these atoms are *radioactive,* and they *decay* into other *isotopes.* There are more than 200 isotopes of 35 elements in this category. Most of the fission products in the United States are found in *spent nuclear fuel* and *high-level waste.*

**Fuel (nuclear).** *Natural or enriched uranium* that sustains the *fission chain reaction* in a *nuclear reactor. Also* used to refer to the entire fuel *element,* including structural materials such as *cladding.*

**Fuel element.** Nuclear reactor fuel including both the *fissile* and structural materials, such as *cladding,* typically in the shape of a long cylinder.

**Gamma radiation.** High-energy electromagnetic *radiation* emitted in the *radioactive decay of* many *radionuclides.* Gamma rays are similar to X-rays. They are highly penetrating.

**Gaseous diffusion.** The process used to make *enriched uranium* in the United States.

**Geologic repository.** A place to dispose of *radioactive* waste deep beneath the earth's surface.

**Half-life.** The time it takes for one-half of any given number of unstable atoms to *decay.* Each *isotope* has its own characteristic half-life. They range from small fractions of a second to billions of years. A general "rule of thumb" in health physics is that the hazardous period for a given isotope is 10 half-lives.

**Hanford Site.** *A* 570-square-mile Federal government-owned reservation in the desert of southeast Washington State. Established in 1943 as part of the *Manhattan Project,* the Hanford Site's chief mission has been the production of plutonium for use in nuclear weapons. Hanford is home to nine *production reactors* and four *chemical separation plants.*

**Health physics.** The science *of radiation* protection, established during the Manhattan Project.

**Highly enriched uranium.** *Uranium* with more than 20 percent of the *uranium 235* isotope, used for making nuclear weapons and also as *fuel* for some isotope-production, research, and power reactors. *Weapons-grade uranium is* a subset of this group.

**High-level waste.** Material generated by chemical *reprocessing of spent _fuel* and *irradiated targets.* High-level waste contains highly *radioactive,* short-lived fission products, hazardous chemicals, and toxic heavy metals. High-level waste is usually found in the form of a liquid, a solid *salt cake,* sludge, or a dry powdery *calcine.*

**Hydrogen.** The lightest element. Two of the three *isotopes* of hydrogen have been used in nuclear weapons: *deuterium* and *tritium.*

**Idaho National Engineering Laboratory (aka INEEL).** An 893-square-mile Federal government-owned reservation in the eastern Idaho desert. The Idaho National Engineering Laboratory is the site of many research and test reactors and of the Idaho Chemical Processing Plant, where *spent nuclear fuel* from the U.S. Navy and from *research reactors was reprocessed.*

**Inert gas.** A gas that does not react chemically with other substances. The inert gases are helium, neon, argon, xenon, and radon. Also occasionally used inaccurately to refer to nitrogen.

**Ionizing radiation.** *Radiation* that is capable of breaking apart *molecules* or *atoms.* The splitting or *decay of* unstable *atoms* typically emits ionizing radiation.

**Irradiate.** To expose to *ionizing radiation,* usually in a *nuclear reactor. Targets* are irradiated to produce *isotopes.*

**Isotopes.** Different forms of the same chemical element that differs only by the number of *neutrons* in their *nucleus.* Most elements have more than one naturally occurring isotope. Many more isotopes have been produced in reactors and scientific laboratories.

**Lithium.** The lightest metal, and the third lightest element. Lithium has two naturally occurring *isotopes,* lithium 6 and lithium 7. Lithium 6 *targets* are *irradiated* to manufacture *tritium.*

**Los Alamos National Laboratory.** The U. S. Government laboratory, established in 1943 as part of the *Manhattan Project that* designed the first nuclear weapons. Located in northern New Mexico, about 60 miles north of Albuquerque.

**Low-enriched uranium.** *Uranium* that has been *enriched* until it consists *of* about 3 percent *uranium* 235 and 97 percent *uranium 238.* Used as *nuclear reactor fuel.*

**Low-level waste.** A catchall term for any *radioactive* waste that is not *spent fuel, high-level, or transuranic waste.*

**Mined geologic disposal.** See *geologic repository.*

**Mixed waste.** Waste that contains both chemically hazardous and *radioactive* materials.

**Molecules.** Larger structures formed by the bonding of *atoms*

**National Environmental Policy Act.** A Federal law, enacted in 1970, that requires the Federal government to consider the environmental impacts of, and alternatives to, major proposed actions in its decision-making processes. Commonly referred to by its acronym, NEPA.

**Natural uranium.** Uranium that has not been through the *enrichment process.* It is made of 99.3 percent uranium 238 and 0.7 percent uranium 235.

**Neutron.** A massive, uncharged particle that comprises part of the *nucleus.* Uranium and plutonium atoms *fission* when they absorb neutrons. The chain reactions that make *nuclear reactors* and weapons work thus depend on neutrons. Manmade elements can be manufactured by bombarding other elements with neutrons in production reactors.

**Nevada Test Site.** A 1,350-square-mile area of the southern Nevada desert that has been the site of most of the U.S. *underground and* atmospheric tests since it opened in 1951. The site is some 65 miles northwest of Las Vegas.

**Nonproliferation.** Efforts to prevent or slow the spread of nuclear weapons and the materials and technologies used to produce them.

**Nuclear reactor.** A device that sustains a controlled nuclear fission *chain* reaction.

**Nucleus.** The clump of protons and *neutrons at* the center of an atom that determine its identity and chemical and nuclear properties.

**Oak Ridge.** A 58-square-mile reservation near Knoxville, Tennessee. Oak Ridge was established as part of the *Manhattan Project* in 1943 to produce *enriched uranium.* Today it is the location of K-25 and Y-12 plants and the Oak Ridge National Laboratory (which was initially referred to by the arbitrary code name, "X-10.").

**Pad**. A flat concrete or asphalt surface used for the temporary storage of wastes. Its purpose is to keep wastes from leaching into the soil.

**PCBs.** A group of commercially produced organic chemicals used since the 1940s in industrial applications throughout the nuclear weapons complex. Most notably, PCBs are found in many of the gaskets and large electrical transformers and capacitors in the gaseous diffusion plants. PCBs have been proven to be toxic to both humans and laboratory animals. "PCB" is an abbreviation of the full name, "polychlorinated biphenyls."

**Plutonium.** A manmade *fissile* element. Pure plutonium is a silvery metal that is heavier than lead. Material rich in the plutonium 239 *isotope is* preferred for manufacturing nuclear weapons, although any plutonium can be used. Plutonium 239 has a *half-life of* 24,000 years.

**Plutonium residues.** Materials left over from the processing of plutonium that contains enough plutonium to make its recovery economically worthwhile.

**Plutonium pit.** A vernacular term that refers to the spherical core of a thermonuclear weapon. This pit is the "trigger" of the primary portion of the weapon that, when compressed, reaches a critical mass and begins a sustained nuclear fission chain reaction.

**Radiation.** Energy transferred through space or other media in the form of particles or waves. In this document, we refer to *ionizing radiation,* which is capable of breaking up *atoms* or *molecules.* The splitting, or *decay,* of unstable *atoms* emits ionizing radiation.

**Radioactive.** Of, caused by, or exhibiting *radioactivity.*

**Radioactivity.** The spontaneous emission of *radiation* from the *nucleus of* an *atom. Radionuclides* lose particles and energy through the process of *radioactive decay.*

**Radionuclide.** *A radioactive* species of an *atom.* For example, *tritium* and *strontium 90 are* radionuclides of elements hydrogen and strontium.

**Radon.** A radioactive *inert gas* that is formed by the decay of radium. Radium is, in turn, a link in the decay chain of *uranium 238.* Radon, which occurs naturally in many minerals, is the chief hazard of *uranium mill tailings.*

**Reprocessing.** Synonymous with *chemical separation.*

**Research reactor.** A class of *nuclear reactors* used to do research into nuclear Physics, reactor materials and design, and nuclear medicine. Some research reactors also produce *isotopes* for industrial and medical use.

**Resource Conservation and Recovery Act (RCRA).** A Federal law enacted in 1976 to address the treatment, storage, and disposal of hazardous waste.

**Salt cake.** A cake of dry crystals of nuclear waste found in *high-level-waste* tanks.

**Siltstone.** *A* concrete-like material made with *low-level radioactive waste.*

**Savannah River Site.** A *plutonium* and *tritium* production site, established in 1950, covering 300 square miles along the Savannah River in South Carolina, near Augusta, Georgia. Five *production, reactors* and two *chemical separation plants* are located here.

**Shielding.** Material used to block or absorb *radiation.* Often placed between sources of radiation and people or the environment.

**Spent nuclear fuel.** *Fuel elements and targets* that have been *irradiated* in a nuclear reactor.

**Strontium.** An element. *Isotope* strontium 90 is one of the most common *fission products.* It has a half-life of about 30 years. Strontium is chemically similar to calcium.

**Superfund.** A term commonly used to refer to the *Comprehensive Environmental Response, Compensation and Liability Act.*

**Thorium.** An element. Thorium is a byproduct of the *decay of uranium.*

**Toxic Substances Control Act.** A Federal law, enacted in 1976 to protect human health and the environment from unreasonable, risk caused by exposure to or the manufacturing, distribution, use, or disposal of substances containing toxic chemicals.

**Transport cask.** A container used to transport *spent nuclear fuel* and other *radioactive* materials. Its purpose is to shield people from radiation while it is transported.

**Transuranic elements.** All elements beyond *uranium* on the periodic table. All *of* the transuranic elements are manmade.

**Transuranic waste.** Waste contaminated with *uranium 233* or *transuranic elements* having *half-lives of* over 20 years in concentrations *of* more than I ten-millionth *of* a *curie of* per gram of waste.

**Tritium.** The heaviest isotope of the element *hydrogen.* Tritium is three times heavier than ordinary hydrogen. Tritium gas is used to boost the explosive power of most modem nuclear weapons, inspiring the term, "hydrogen bomb." It is produced in *production reactors* and has a *half-life* of just over 12 years.

**Uranium.** The basic material for nuclear technology. It is a slightly *radioactive* naturally occurring heavy metal that is more dense than lead. Uranium is 40 times more common than silver.

**Uranium 233.** A manmade *fissile isotope of uranium.*

**Uranium 235.** The lighter of the two main *isotopes of uranium.* Uranium 235 makes up less than 1 percent of the uranium that is mined from the ground. It has a *half-life* of 714 million years. Uranium 235 is the only naturally occurring fissile element.

**Uranium 238.** The heavier of the two main *isotopes* of *uranium.* Uranium 238 makes up over 99 percent of uranium as it is mined from the ground. It has a *half-life of 4.5* billion years. It is not easily split by *neutrons.*

**Vitrification.** A process that stabilizes nuclear waste by mixing it with molten glass. The glass is poured into metal canisters, where it hardens into logs. Plants for vitrifying *high-level-waste* have been built in the United States at *West Valley,* New York, and the *Savannah River Site.*

**Waste Isolation Pilot Plant (WIPP).** A *geologic repository* intended to provide permanent disposal deep underground for transuranic wastes. Located 2,150 feet underground in a salt bed near Carlsbad, New Mexico.

**West Valley Demonstration Project.** A plant near Buffalo, New York, used to demonstrate the *reprocessing of spent nuclear fuel* from commercial nuclear power plants. West Valley operated from 1966 to 1972. A *vitrification* plant for *high-level waste has* been built at the site.

**Yucca Mountain.** A site on, and adjacent to, the *Nevada Test Site* that is being examined to determine whether it is suitable for use as a geologic repository for the Department's *high-level wastes* and *spent fuel from* commercial nuclear reactors.