THE EFFECTS OF A MANDATORY EARLY SHUTDOWN OF MAINE YANKEE

DEPARTMENT
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MAINE STATE PLANNING OFFICE
RICHARD H. SILKMAN, DIRECTOR

STATE OF MAINE
EXECUTIVE DEPARTMENT
STATE PLANNING OFFICE

JOHN R. McKERNAN, JR.
GOVERNOR

RICHARD H. SILKMAN
DIRECTOR

October 4, 1987

The Honorable John R. McKernan, Jr.
Governor of Maine
State House Station One
Augusta, Maine 04333

Dear Governor McKernan:

On November 3, Maine voters will decide if Maine Yankee should be allowed to continue to operate. This marks the third time that Maine voters are being asked to decide the fate of the Maine Yankee Atomic Power Plant. Because of the importance of this decision, you have asked us to review, update, and expand upon the findings of the 1986 Maine Yankee Shutdown Assessment.

We have found the 1986 study to be essentially sound. This work expands upon the 1986 report by updating the discussion of legal issues posed by the referendum and by extending the analysis of economic and environmental issues. Our work benefits from events and research subsequent to 1986 including:

judicial decisions, such as the First Lutheran case decided this June by the U.S. Supreme Court;

the proposed Central Maine Power power purchase from Hydro Quebec and our subsequent analysis of it;

proposals for competitive domestic power production submitted to Central Maine Power in response to their solicitation; and

analysis of the April 1986 accident at the Chernobyl nuclear power station in the Soviet Union.

A decision regarding a state-mandated shutdown of Maine Yankee raises the question of State authority to effect such a shutdown. While it is always very difficult to predict how a court will rule on federal preemption, as with the 1986 report, we find it highly unlikely that a State law closing a nuclear plant due to waste disposal and safety concerns could withstand judicial review. A 1983 Supreme Court decision firmly upheld federal authority in the entire field of nuclear safety concerns.

The higher cost of replacement power, estimatd to be $779 million (present value) over the period 1989-2015, will raise electricity rates in Maine by between 5 and 10% statewide. This rate effect would vary around the State, however. Rates in Aroostook County would be most affected because of its heavier dependence on Maine Yankee as a source of power. In fact, rates in Aroostook County could increase by between 8 and 20% between 1989 and 2008. Lower dependency on Maine Yankee will moderate rate impacts in the Central Maine Power and Bangor Hydro Electric regions, keeping them in the 5 to 9% range. But I must strongly emphasize that this is just one component of the total cost of a shutdown. Maine taxpayers will have to bear the cost of any compensation determined to be owed to the owners of Maine Yankee.

Closing Maine Yankee in 1988, 20 years ahead of its scheduled retirement, would affect the Maine economy in several ways. First, increased electric rates will raise production costs of Maine businesses and reduce disposable income of Maine households. We have estimated that replacing Maine Yankee power will add $779 million (present value) to energy costs in Maine between 1989 and 2015.

Second, the cost of any compensation due the owners of Maine Yankee, possibly over $1 billion, would be borne by Maine taxpayers, further reducing their income and draining capital from the State. Finally, the Town of Wiscasset and surrounding communities would experience the loss of a major employer and taxpayer.

The need for replacement power may offset some of the economic costs of a mandatory shutdown. Replacing Maine Yankee entirely with domestic power could create up to 1600 jobs and generate $575 million in income (present value). However, the net effect of these economic impacts is to reduce income in Maine by $1.38 billion and permanently eliminate 1390 jobs between 1989 and 2008.

The principal benefit to be derived from an early shutdown of Maine Yankee would be the elimination of the risk of a catastrophic operations accident at the Wiscasset facility. The April 1986 accident at the Soviet Union's Chernobyl nuclear power station has heightened public concerns regarding the safety of nuclear power in general.

While closing Maine Yankee eliminates the threats associated with an operating nuclear plant, those associated with decommissioning and waste disposal remain. The outcome of the referendum will have no impact on the selection of Maine as a high-level nuclear waste site. We can find no connection between the production of nuclear waste at Maine Yankee and the site selection process established by the Department of Energy. Moreover, sources of replacement power--biomass, hydro, oil and Canadian imports--will, themselves, pose significant

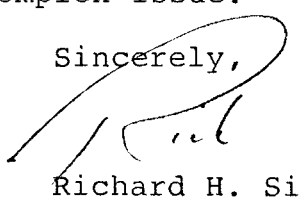
environmental and health threats.

Comparing the risk and consequences of a catastrophic accident against the economics of increased energy costs presents a formidable challenge. Quantifying the economic costs of an early shutdown, as presented here, is an effort to put this complex issue into perspective. As noted in this report, the actual costs of replacing Maine Yankee could vary considerably from these estimates. Of particular importance to the costs of replacing Maine Yankee are the price of replacement power, the actual cost of operating Maine Yankee over the next 20 years, and the basis upon which the owners of the facility will be compensated, if compensation is required.

Whatever the costs of closing Maine Yankee, a vote to shut down the plant will have an impact on the lives of every Maine citizen. It is crucial that a decision so critical to our future be based upon as clear an understanding of its consequences as possible.

It is my hope that this study adds to a clearer understanding of the issues surrounding an early shutdown of Maine Yankee. Thank you for the opportunity to serve you and the people of Maine in this complex issue.

Sincerely,



Richard H. Silkman

RHS:nv

THE EFFECTS OF A MANDATORY EARLY SHUTDOWN OF MAINE YANKEE

September, 1987

Maine State Planning Office
Richard Silkman, Director

State Planning Office
Richard H. Silkman, Director
Stephen J. Adams, Senior Economist
Charles S. Colgan, State Economist

Office of the Public Advocate
Stephen G. Ward, Public Advocate

Office of Energy Resources
Harvey DeVane, Director
Steven Buchsbaum, Resource Economist

THE EFFECTS OF A MANDATORY EARLY SHUTDOWN OF MAINE YANKEE

1. INTRODUCTION

On November 3, Maine voters will be asked to decide whether Maine Yankee, or any other high-level nuclear waste producing facility, should be allowed to operate in this State, or whether Maine Yankee should be closed before its scheduled shutdown in 2008. Because of the important implications of this decision, Governor John R. McKernan, Jr. directed the State Planning Office with the assistance of the Office of Energy Resources, Public Advocate, and the Advocacy Staff of the Public Utilities Commission, to examine the legal and technical constraints and the costs and benefits to Maine of an early shutdown of Maine Yankee.

An assessment of this issue was submitted by these agencies to Governor Joseph E. Brennan in May, 1986. Subsequent legal decisions, more detailed studies of the Chernobyl accident in the Soviet Union, and analyses of Maine energy alternatives in conjunction with the review of the proposed Hydro Québec power purchase provide new insight into the implications of an early shutdown of Maine Yankee.

This analysis reviews the findings of the 1986 report, updates the legal issues posed by the referendum, and expands the analysis of economic effects. In addition, it presents the results of examinations of the Chernobyl nuclear accident and a review of the environmental issues surrounding energy alternatives.

SUMMARY OF THE 1986 MAINE YANKEE REPORT

Maine Yankee Assessment: A Report to Governor Joseph E. Brennan, 1986 analyzed the legal, technical, and economic issues associated with a forced early shutdown of Maine Yankee.

Legal Issues

The 1986 analysis, based on a legal opinion of the Attorney General, found it unlikely that the State of Maine has the legal authority to force an early

shutdown of Maine Yankee on the basis of safety considerations of nuclear plant operations. Citing a 1983 Supreme Court decision that federal authority in nuclear power overrides State concerns regarding health and safety, the 1986 report noted that State action would require Congressional repeal of the preemptive features in federal nuclear-related statutes.

The report also found "no more than a tenuous legal connection" between the presence of a nuclear power generating plant and the placement of a high-level waste repository in Maine. It noted that an early shutdown of Maine Yankee would still leave its existing wastes to be disposed of and would have no significant impact on the nation's nuclear waste problem.

Costs and Benefits of a Mandatory Shutdown

The principle benefit of an early shutdown of Maine Yankee is the elimination of the risk of a catastrophic accident. The report also noted the benefit associated with the cessation of production in Maine of low-level nuclear waste and spent fuel. The costs of an early shutdown—higher energy costs to households and industry, potential compensation to out-of-state owners, and the jobs lost at Maine Yankee—were estimated to fall between $500 million and $6.8 billion with a consequent loss of between 1000 and 1800 jobs.

THE 1987 UPDATE

This analysis reviews many of the issues discussed in the 1986 report. In addition, it benefits from events and research subsequent to the 1986 publication. Included among these are:

- a number of judicial decisions, including the First Lutheran case decided in June of this year regarding the "temporary taking" of private property;

- the proposed CMP power purchase from Hydro Québec submitted in March and its subsequent analysis by the State

Planning Office, Office of Energy Resources, Public Advocate, and Departments of Conservation and Environmental Protection[1];

- proposals for domestic power production competitive with the purchase of power from Hydro Québec submitted in response to a request for proposals issued by Central Maine Power; and

- a summary of analyses of the April 1986 accident at the Chernobyl nuclear power station in the Soviet Union.

The legal issues presented here are discussed in somewhat more detail than in the 1986 report. A more comprehensive analysis of the economic costs and benefits of an early shutdown is provided including the potential impacts of compensation costs, and a more detailed breakdown of the regional rate impacts of an early shutdown. Finally, this report presents an assessment of the implications of past power facility accidents and the environmental consequences of alternative energy sources.

[1] Preliminary Report on the Effects of the Proposed Purchase of Power from Hydro Québec, State Planning Office, May. 1987.

2. LEGAL ISSUES*

Two principal legal questions are raised by the proposal to force an early shutdown of Maine Yankee: what authority exists for Maine to order a nuclear plant shutdown on health and safety grounds? If authority can be established, what is the value of the Maine Yankee nuclear plant and how much must Maine taxpayers compensate its owners as a result of a mandatory early shutdown?

Although these issues were examined in the 1986 Maine Yankee shutdown assessment, they require reexamination in light of several recent United States Supreme Court decisions pertaining to the issues of federal preemption and just compensation.

FEDERAL PREEMPTION OF A STATE-MANDATED SHUTDOWN

The Supremacy Clause, Article VI of the U.S. Constitution, provides Congress with the power to preempt state law. When a state law or regulation establishes requirements inconsistent with federal legislation, the federal courts evaluate the necessity of preempting state law. There are a number of federal statutes which may conflict with, or preempt, a state law prohibiting the generation of nuclear waste. These include: the Atomic Energy Act of 1954; the Nuclear Waste Policy Act of 1982; and the Federal Power Act of 1936.

To date, no Maine court has reviewed the question of state authority to regulate radioactive waste generation in the context of federal law. However, courts in Maine have evaluated federal preemption of state laws in other matters. For example, a Maine law mandating severance pay in plant closings was recently upheld by both the Maine and United States Supreme Courts, notwithstanding issues of federal preemption. In this case, the courts concluded that the federal jurisdiction of the National Labor Relations Board did not

* This is derived from a legal analysis provided by the Public Advocate. See appendix.

preempt the Maine law, given State interests in preventing economic dislocation due to plant closings.[2]

In a number of federal and state courts elsewhere, however, this issue has received close examination with the consistent result that state authority has been found to have been preempted and, therefore unconstitutional under the Supremacy Clause. (See especially U.S. v. The City of New York.[3]) Based on these numerous precedents which set forth under two distinct theories of federal preemption, enactment of the 1987 Maine Yankee referendum is unlikely to survive legal challenges in federal court.[4]

With particular reference to the issue of nuclear waste raised by the referendum, the Atomic Energy Act preempts state regulation of nuclear power safety and radiation hazards. This was upheld in a 1983 Supreme Court decision from California, Pacific Gas and Electric Co. v. State Energy Resources Commission .[5] In that case, the Court held that:

> "State safety regulation is not preempted only when it conflicts with federal law. *Rather the Federal government has occupied the entire field of nuclear safety concerns...*"[6] (Italics added)

A state law closing a nuclear plant due to waste disposal and safety concerns would undoubtedly be found unconstitutional, barring Congressional amendment of the Atomic Energy Act.

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[2] Director of Bureau of Labor Standards v. Fort Halifax Packing Co., 510A[2] 1054 (ME 1986), cert. den., __US__1987. See however, Bayside Enterprises Inc. v. Maine Agricultural Bargaining Board 513 A[2] 1355 (ME 1986) where Maine law was preempted by the federal Agricultural Fair Practices Act.

[3] 643 FS 604 (SDNY,1978).

[4] The theories can be summaried as follows: the Atomic Energy Act preempts state regulation of nuclear power safety and radiation hazards; the Federal Power Act preempts state regulation over wholesale sales of electricity in interstate commerce.

[5] 461 US 190 (1983).

[6] Op. Cit, pages 212-213.

JUST COMPENSATION

Both the Maine and United States Constitutions provide assurance that private property may not be taken for a public purpose without payment of "just compensation". These Constitutional guarantees, and the state and federal court cases interpreting them, hinge on three successive issues:

When does the State have power to take private property?

If such power is lawfully used, does the State owe compensation?

By what measure of value must compensation be awarded?

Each of these questions presents different issues for consideration in the context of a forced shutdown of the Maine Yankee power plant.

State Power to Take Private Property

A state typically exercises its power to take private property by means of its powers of eminent domain. The use of this extraordinary power has prompted numerous courts to warn of the care necessary in evaluating whether compensation is owed from such a taking.

There is considerable Maine and U.S. Supreme Court precedent for the proposition that, when the state properly exercises its police powers to protect the public health and safety the complete elimination of a non-conforming business does not create a compensable loss under the Fifth Amendment or the Maine Constitution.

While there must be a public use to justify a state taking, the U.S. Supreme Court has stated that it is proper to defer to the Legislature (or in the case of the 1987 Referendum to the voters) in determining whether the public use is a reasonable one. Under current Fifth Amendment standards, it appears that as long as the public use merely represents a "conceivable public

purpose", a state will satisfy the threshold public purpose requirement. It appears likely that the 1987 Referendum would pass this threshold test.

Compensation Due Only When a Taking Has Occurred

Just compensation is owed only in circumstances where the courts find that a constitutional taking has occurred. No taking occurs or is compensation owed unless the state interferes with distinct investment-backed expectations to a major and unsupportable degree. Recent Maine Law Court decisions go further: just compensation may be due only in cases where the market value of the condemned property has been reduced to zero. Due to the fact that the affected property retained possible rental income potential or could be sold, the Law Court concluded that no taking had occurred in a recent case:

> It is clear from the preponderance of the believable evidence that beneficial and valuable uses of their property remain available to the Halls despite the denial of a building permit by the B.E.P. Accordingly, we hold that there has been no taking of the Hall property in violation of article 1, section 21 of the Maine Constitution. Hall v. Board of Environmental Protection. A2 (1987), slip. op. at 5, 7/14/87.

It is by no means certain that either a federal court or the Maine Law Court would construe the U.S. Constitution requirements on this basis in the case of a state-mandated closure of Maine Yankee.[7]

In general, when property is rendered "substantially useless" due to state action, a compensable taking has occurred.[8] The question of whether the forced closure of Maine Yankee constitutes a compensable taking will hinge on interpretations of fact: will the Maine Yankee owners retain significant

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[7]Such an analysis would presumably consider whether the Wiscasset site could continue to provide value for its owners by generating electricity by non-nuclear means or whether the costs of such a conversion is prohibitive.

[8]Sibley v. Inhabitants of the Town of Wells, 462 A 29, 31 (Me 1983); LURC v. White, 521 A 710 (Me 1987).

beneficial uses of their property after closure, will the public utility status of the owners insure mitigation of any loss, or will the value of the property realistically be reduced to zero? In addition, the court will be guided by fundamental principles of fairness:

> "The purpose of forbidding uncompensated takings of private property for public use is "to bar government from forcing some people alone to bear public burdens which, in all fairness and justice, should be borne by the public as a whole." Penn Central at 1027 citing Armstrong v. US 364, US 40, 49 (1960).

Measure of Value For a Compensable Taking

The remaining questions concern the proper measurement of the Maine Yankee owners' loss should compensation be due. The courts have consistently ruled that compensation, when justified, should be based on the "fair market value" of the asset. In this case, three measures of such value could be applied. In descending monetary value, these three are: the costs of constructing a "substitute facility" elsewhere; the economic value of the power produced at the Maine Yankee plant; or the net book value of the power plant, as recorded for ratemaking by the Public Utilities Commission and by the Federal Energy Regulatory Commission.

Replacing Maine Yankee with a substitute facility could cost between $3-5 billion, based on completion of recent nuclear power plants of Maine Yankee's size or greater. While Maine Yankee's owners are obligated under state utility laws to provide electricity to the public, they are not specifically required to generate that electricity at a nuclear facility. Consequently, it would appear that the "substitute facilities" standard would not be required in the case of compensation due Maine Yankee's owners.

Since large nuclear power plants are rarely bought and sold, the value of Maine Yankee on an open market will be exceedingly difficult to establish using a comparable sales standard. Rather, the value of power generated at Maine Yankee during the remaining years of its NRC license will probably be used as

a reasonable approximation of fair market value. The cost of replacement power was selected in the 1986 State Planning Office study as the most objective standard for measuring any compensation owed to Maine Yankee's owners.

The third measure of fair market value is the net book value of the facility. There is a question, however, of whether Maine Yankee's value can properly be measured by the net book value of the facility as recorded in regulatory accounting practice. This question ultimately can only be determined by a court, and is subject to substantial conflicting claims. On the one hand, the courts have repeatedly discounted claims of loss for future profits as not compensable under the Fifth Amendment.[9] Hence, the Maine Yankee owners' claim for compensation on a future return on the net book value of their asset ($209,339,893 as of June 30, 1987, including recent construction work) is subject to challenge. On the other hand, numerous courts have distinguished as inconsistent the underlying purposes of ratemaking valuation of utility property and of Fifth Amendment compensation. Maine Yankee owners will undoubtedly point to something in excess of net book value as the measure regularly upheld in the case of public takings of private property.

Whichever of these three measure is ultimately determined by the courts to apply, the actual impact of the 1987 Referendum will be borne by two groups—Maine taxpayers and Maine electricity consumers, or ratepayers. Maine taxpayers will bear the full cost of compensating out-of-state owners, the effect of which will constitute a transfer from Maine's General Fund to the rest of New England equal to 50% of the fair market value of Maine Yankee. The ratepayers, on the other hand, will have to bear the full cost of any and all power necessary to replace the electricity generated by Maine Yankee for use within Maine. This distinction is important because some taxpayers are not ratepayers and some ratepayers are not taxpayers.[10] Thus, the consequences of a

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[9]"The opportunity to use property for future profit is not such a fundamental attribute of ownership [as to require compensation]" Seven Island Land Co. v. Maine LURC, 450 A2 475, note 10 (Me. 1982), quoting Andrus v. Allard, 444 US 51, 60 (1980).

[10] There is a substantial number of taxpayers who are not ratepayers of CMP, BHE, or MPS. These include all the customers of Maine's publicly-owned in five towns, four cooperatives, and four islands.

mandatory early shutdown will be different for individuals or businesses in Maine depending on how the Legislature, the Public Utilities Commission, and the courts treat the compensation payment. The overall impacts on the State, however, will be similar and are discussed in Section 3.

LENGTH AND COSTS OF LITIGATION

The 1987 Referendum could well set in process a complex and time-consuming series of court challenges to the new law. The fact that these questions have not previously been litigated in the context of a forced nuclear plant closure will only add to the time and expense of these challenges. Because any final judicial decision upholding the 1987 Referendum could well stimulate similar efforts in other states, it is likely that the legal resources available to the Maine Yankee owners will be substantial.

Consequently, it is likely that the litigation triggered by enactment of the Referendum will not be concluded until well into the next decade, and will be quite costly. It is not clear whether the costs of this litigation are precluded from recovery at the Federal Energy Regulatory Commission for wholesale ratemaking purposes. It is likely that, in future proceedings before the Maine Public Utilities Commission, the recovery of these litigation costs in the retail rates would, itself, be litigated.

A more important issue is whether the State would owe compensation from the date of the Referendum's enactment, or from the date that a court finally rules that compensation is due. Hypothetically, this later date could be 1992, if Maine Yankee is shut down during this litigation period.[11] Until recently, the answer to this question was relatively simple: Maine Yankee's owners would have to wait for compensation until the date of a final court determination and then only after all proper procedures and remedies had been pursued. At that point, compensation could well be prospective only, and not encompass any claim of taking for the period covered by the appeal itself.

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[11] Maine Yankees owners could seek a temporary restraining order to prevent enforcement of the Maine law closing the plant.

However, this conclusion is now subject to considerable doubt. A 1987 United States Supreme Court decision has for the first time concluded that, if Fifth Amendment concerns ultimately compel payment of just compensation, compensation is also owed for any "temporary taking" which occurred while the issue was before the courts. First English Evangelical Lutheran Church of Glendale v. County of Los Angeles, __US__, slip. op. 6/9/87. In cases where a condemnee has been denied *all* use of its property during the appeal period prior to a successful appeal, failure to provide "payment of fair value for the use of the property during this period of time would be a constitutionally insufficient remedy."

Based on this recent decision, it appears probable that replacement power costs, or some other measure of fair value, would be awarded Maine Yankee's owners for the appeal period, if Maine Yankee does not operate during the appeal period. However, unless a court ultimately upholds the constitutionality of the Referendum in a final judgment, and finds that a compensable taking has occurred, no compensation would be owed Maine Yankee's owners.

3. ECONOMIC ISSUES

The electricity supplied by Maine utilities is generated from various sources. Maine Yankee, with an average capacity of 840 MW, produces, on average, about 4.8 billion kwh per year, provides about 27% of all electricity sold by Maine utilities, and supplies 22% of all the electricity consumed in Maine. An early shutdown of this facility will necessitate replacing that portion of Maine's electricity needs currently fulfilled by Maine Yankee.

Closing Maine Yankee in 1988, 20 years ahead of its scheduled retirement, would affect the Maine economy in several ways. First, securing replacement power, both in the short and long run, will increase energy costs to Maine consumers and businesses. Second, the cost of any compensation due the owners of Maine Yankee would be borne by Maine taxpayers, further reducing their income, and draining capital from the State. Finally, the Town of Wiscasset and surrounding communities would experience the loss of a major employer and property taxpayer.

Some of these adverse effects will be offset by the economic consequences of creating replacement power capacity and energy in Maine. The shift to additional domestic energy production, for example, will create job opportunities and tax revenues as a result of building, operating, and fueling new power facilities. Employment will also be created in the design, sale, installation, and perhaps production, of energy-saving devices.

REPLACEMENT POWER ALTERNATIVES

Replacement of the power lost due to an early shutdown of Maine Yankee would likely come from a mix of sources. In the short-run, replacement power would come from the same sources currently tapped when Maine Yankee shuts down for maintenance. These may include underutilized oil-fired plants in Maine, the least expensive available units in the New England Power Pool, and special arrangements with New Brunswick. Conditions for securing this short-term power are less onerous today than they were three years ago,

and are likely to be in the future, largely because of low oil prices and a Canadian power surplus.

A shutdown decision today would have long-term implications. Over the next twenty years, it would be necessary to develop new sources of electric capacity to replace Maine Yankee. Intensified conservation, domestically generated biomass, more small hydroelectric facilities, oil, natural gas, and coal power, and the increased importation of Canadian-produced power make up the range of alternative power sources likely to be tapped over this long-term. At the same time, Maine's total energy needs continue to grow and electricity rates increase. The need to meet both the replacement power needs from an early shutdown of Maine Yankee, and increasing energy demand will make the proposed importation of Hydro Québec power by Central Maine Power more compelling.

Two recent developments indicate a larger potential for available future energy capacity than previously expected. The recent Central Maine Power proposal to purchase large blocks of power from Hydro Québec has enhanced potential Canadian import options. In addition, industrial firms and independent power producers in Maine have proposed over 1400 MW of new projects to CMP at prices competitive with the Hydro Québec proposal. Responses from a similar request for proposals for conservation projects are under evaluation, with further rounds of conservation bidding planned for 1988.

STATEWIDE ECONOMIC IMPACTS

Cost of Replacement Power

The uncertainties of relative energy prices render precise rate impact comparisons among replacement power alternatives impossible. Electricity pricing is very complex and depends on many highly variable and unpredictable factors. Construction costs, long-term fuel prices, energy technology, the success of cost-effective conservation projects, and the pricing policies of the Public Utilities Commission all influence the price of new electric

capacity. As a result, it is impossible to predict accurately how the price of power from a particular source will change over time.

Given the attention afforded the current Hydro Québec proposal, and its already appreciable influence on the potential price of new in-state power[12], this analysis assumes that new Hydro Québec power will be included in the mix of replacement power under the terms of the February 11, 1987 Letter of Intent. This is not to pass judgment on the merits of this proposal. In fact, alternative energy sources may be priced somewhat below or somewhat above the current Hydro Québec price.

To estimate replacement power costs, utility revenue requirements both with and without Maine Yankee are projected for the next 30 years. It is assumed that in the case of a shutdown, the plant would be closed sometime in 1988.[13] Meaningful analysis of replacement power costs requires further assumptions regarding future energy supply and demand conditions. The approach taken here has been to adopt typical current planning assumptions for each of Maine's three largest utilities. Specifically:

- power to replace Maine Yankee is assumed to come from a combination of conventional sources, including renovation of existing plant, expanded power purchased from domestic and Canadian sources, and increased results from conservation and load management programs;

- fuel price escalation rates and capacity costs are the same as those assumed by CMP in its recent analysis of the Hydro Québec purchase option;

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[12]The recent agreement between CMP and Boise Cascade for the construction of a 75 MW wood/coal fired cogeneration system in Rumford was priced at a discount below the Hydro Québec price, reported at 4%. In addition, industrial firms and independent power producers in Maine had proposed over 1400 MW of projects to CMP at prices competitive with the Hydro Québec proposal.

[13]Use of this date incorporates into the analysis at least a portion of the "temporary taking" costs required by the recent First Lutheran decision, compared with use of a later date, such as 1992.

- while the aging of the nuclear plant at Wiscasset will likely reduce its annual output as maintenance shutdowns become more frequent, for simplicity it is assumed here that Maine Yankee would continue to provide an average of about 840 MW annually for the rest of its planned operating life. If so, 420 additional MW would be needed to replace Maine Yankee power consumed in Maine.

The results of this analysis are shown in Table 1. Replacing Maine Yankee power could raise energy costs in Maine by $50 to $60 million per year between 1989 and 1993, as indicated. This would rise to between $60 and $100 million per year after 1993, due to the costs of developing new long-term capacity. After 2008, the cost situation would reverse as a result of what are called "end effects".

Table 1
REPLACEMENT POWER COSTS OF A MANDATORY SHUTDOWN OF MAINE YANKEE

Replacement Power Cost

(Millions 1986$)	TOTAL	CMP	BHE	MPS
1989-1992	229.6	167.3	41.3	21.0
1989-2008	1540.0	1123.0	248.0	168.0
1989-2015	984.0	732.0	150.0	102.0
(Present Value in 1989*)				
1989-2008	984.0	719.0	160.0	105.0
1989-2015	779.0	573.0	125.0	80.0

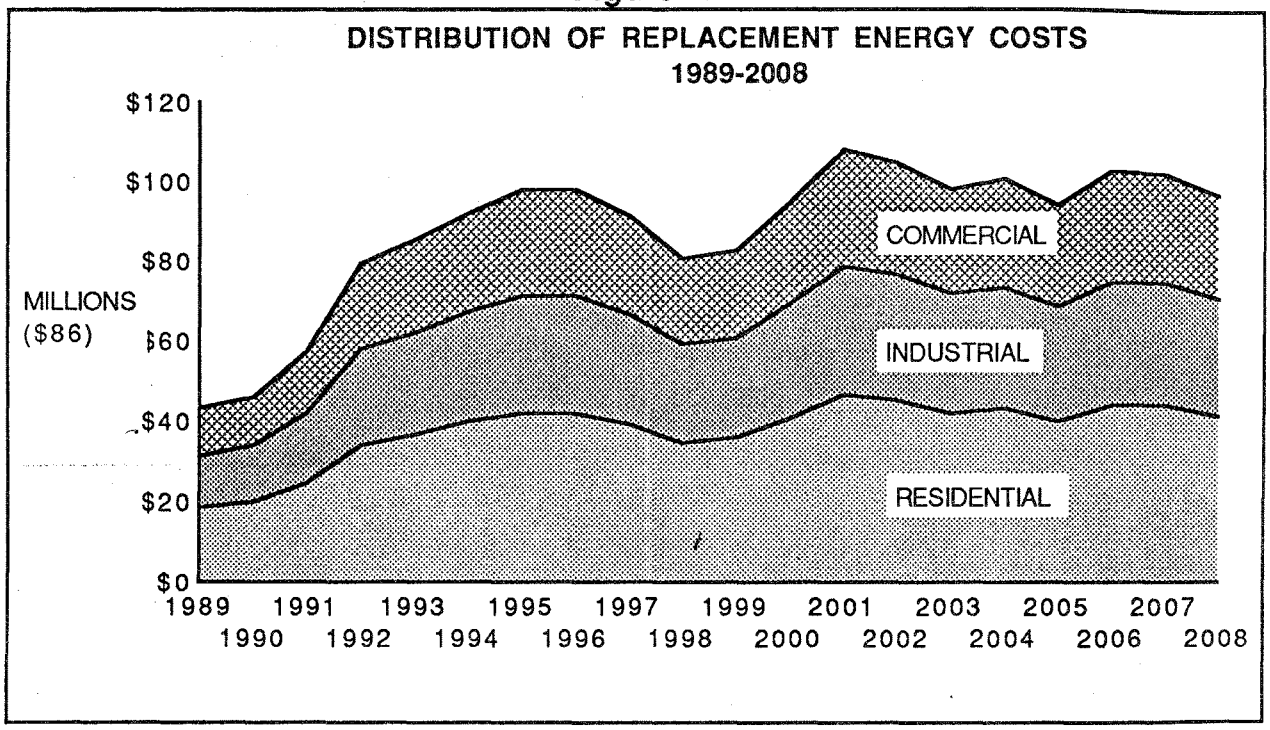
* 4.3 % real discount rate

These end effects are the result of incurring the costs to replace Maine Yankee earlier than would be the case if the plant ran through its license period. Without a shutdown, Maine Yankee would have to be replaced in the year 2008 when its operating license expires. By replacing the facility earlier, these costs

are accelerated in time. The result of these end effects would be to reduce energy costs by $50 to $120 million per year between 2009 and 2015.

Assuming that consumer electricity purchases maintain proportions roughly similar to 1986, these costs would be distributed between residential, commercial, and industrial consumers as shown in Figure 1.[14]

Figure 1



These replacement power costs imply an overall increase in average electric rates in Maine on the order of 5 to 10% between 1989 and 2008, with a corresponding decrease for several years thereafter, as a result of the end effects.

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14 Based on proportion of sales revenue by customer class for CMP, Bangor Hydro Electric, and Maine Public Service combined. These proportions are: residential--43%; commercial--27%; and industrial--30%. As noted earlier, Maine's utilities project increases in power costs over the next five years for other reasons. It is not clear whether these increases will provoke major industrial customers to reduce their purchases of electricity by generating power themselves. If such reductions occur, the shutdown impact for residential customers will be significantly greater than shown in Figure 1.

The actual rate effects of replacement power costs would vary around the State, depending on local utility dependence on Maine Yankee. The greatest rate impact would be felt in the Maine Public Service service area, primarily Arrostook County, followed by the service areas of Bangor Hydro Electric, and Central Maine Power. The impacts of these effects on Maine's regions are discussed below, and illustrated in Figure 2, and Table 3.

Compensation to Out-of-State Owners

The legal issues surrounding compensation to out-of-state owners of Maine Yankee are discussed in some detail in Section 1. As noted, the amount of compensation owed to out-of-state owners will be determined only after what is likely to be a protracted legal debate. This analysis benefits by no more precise indication of the amount of such compensation than did the 1986 report. That analysis estimated compensation at between $120 million and $3.4 billion. As discussed in the legal analysis, it does not appear that any compensation due the owners could be less than the current net book value of the facility which is $209,339,000; in the case of out-of-state owners, compensation would be one-half the determined amount. For this analysis, we have used the cost of replacement power measure to determine compensation. We have computed this to be $984 million (see Table 3), or approximately $1 billion, for in-state owners and have used this figure for compensation to out-of-state owners as well.[15]

As also noted in Section 1, it is likely that if Maine Yankee is closed temporarily, prior to a successful appeal, the owners would be awarded compensation for the period of this "temporary taking". The amount of this temporary compensation is not explicitly incorporated here (see footnote 12).

To illustrate the impact on the Maine economy of this $1 billion obligation to out-of-state owners, we have used a compensation schedule which assumes that this judgment is paid through a $1 billion bond issue over the balance of

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[15] This could be a conservative estimate since out-of-state owners are not likely to have access to as inexpensive sources of power as biomass and Hydro Québec as do the in-state owners. Without such access, the cost of replacement power will be as much as 20-30% higher.

the license period of the plant (20 years). At an interest rate of 8%,[16] this would require level payments of $101,852,000 each year from the General Fund. Collection of this revenue is assumed to be achieved through an increase in personal income taxes. The estimated impacts of these payments are discussed below.

Income and Employment Impacts of a Mandated Shutdown

Higher electricity costs can affect jobs in two ways. For commercial and industrial consumers, higher electricity costs can harm the competitive position of Maine firms in comparison with other states or countries. With higher production costs, these firms will be unable to capture larger, or maintain their existing, shares of their markets, thereby forcing a reduction in employment. This will be especially true for those firms which cannot produce their own electricity.

For residential consumers, higher electricity prices reduce the amount of disposable income available to support consumption. This reduced consumption, in turn, eliminates jobs throughout the economy but especially in retail trade and other service sectors. Income lost to compensating out-of-state owners affects the economy in the same way. In addition, the drain of income out of the State, as would occur in the case of compensation payments, reduces the amount of capital available for investment in Maine businesses.

On the other side of the equation are the income and employment additions associated with new domestic power production. While it is not at all certain that Maine Yankee power would be replaced by power produced in the State, Maine's nascent independent power industry has already seen significant growth. The need for long-term power to replace Maine Yankee could provide additional impetus for the development of this industry in Maine.

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[16] This is somewhat below the 30-Year Treasury Bill discount rate as an estimate of the cost of capital to Maine for a 20-year bond issue. The actual rate could be lower since state debt could be issued as tax exempt. Alternatively, such a large pubic issue could adversely affect Maine's creditworthiness, forcing a higher interest rate.

Cogeneration facilities at paper mills, along with free-standing wood-chip and municipal waste generation plants have emerged as a major source of electricity supply in Maine, rising from less than 1% of CMP's supply in 1975 to approximately 15% today. By 1990, these types of plants are expected to provide 30% to 40% of CMP's supply. It is anticipated that replacement power needs from an early shutdown of Maine Yankee would result in the construction of more cogeneration and independent power facilities in Maine.[17]

The income and employment impacts of higher energy prices and compensation payments on the Maine economy were estimated using the Maine Policy Analysis Model (MEPAM). Those impacts resulting from expanded domestic power production were drawn from the recent analysis of the Hydro Québec proposal.[18] That analysis estimated the income and employment impacts of 600 MW of domestic power capacity. For this analysis, we have scaled down those impacts to reflect the need for only 420 MW to replace Maine Yankee, all of which was assumed to be produced within Maine.

The income and employment impacts are presented in Table 2. Employment impacts are presented for two time-periods—1989 through 1992; and from 1993 to 2008— and are expressed as the average per-year impact over each period. Income impacts are presented over the full period 1989 to 2008 and expressed as a present value in 1986 dollars. The net impacts of a mandatory shutdown, as presented here, are the sum of the effects of higher electricity costs and the compensation due out-of-state owners plus the positive impacts due to domestic production.

As shown in the table, a mandatory shutdown of Maine Yankee could cost the citizens of Maine $1.38 billion over the twenty year period from 1989-2008. This figure represents the present value of the income impacts of the

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[17] Additional jobs would also be generated through energy conservation programs. We do not have good data to estimate the potential of such job creation and thus have not included it in our analysis.

[18] Preliminary Report on the Effects of the Proposed Purchase of Power from Hydro Québec, State Planning Office, May 1987.

replacement power costs, payments to out-of-state owners, and domestic power production.

Table 2
SUMMARY OF STATEWIDE ECONOMIC IMPACTS OF A 1988 RETIREMENT OF MAINE YANKEE

INCOME IMPACTS (Present Value, 1986 $)		1989-2008
Replacement Power		-$496 Million
Compensation Payments		-$1,311 Million
Maine Yankee Facility (Direct & Indirect)		-$146 Million
Domestic Production* (Direct & Indirect)		$575 Million
Net Impact		-$1,378 Million
EMPLOYMENT IMPACTS (Average Annual Job Loss/Gain)	1989-1992	1993-2008
Replacement Power	-650	-930
Compensation Payments	-1500	-700
Maine Yankee Facility (Direct & Indirect)	-1300	-1300
Domestic Production* (Direct & Indirect)	700	1600
Net Impact	-3500	-1390

* Assumes that all of the replacement power (420 MW) is generated by facilities within the State of Maine. To the degree that this is not the case, e.g., Hydro Québec supplies some of the replacement power, these numbers should be reduced proportionately.

Interestingly, the employment consequences of a mandatory shutdown are less severe than one might expect in light of the significant income impact. The replacement of Maine Yankee with domestic generation is itself an employment generator. This occurs primarily through construction of new facilities in the early years, and in the later years through harvesting and transporting biomass fuel and operating the new facilities. These new jobs

offset some of the employment losses associated with the higher costs of replacement power and compensation payments. However, it is important to note that these gains result only if replacement power is provided by in-state facilities.

REGIONAL IMPACTS

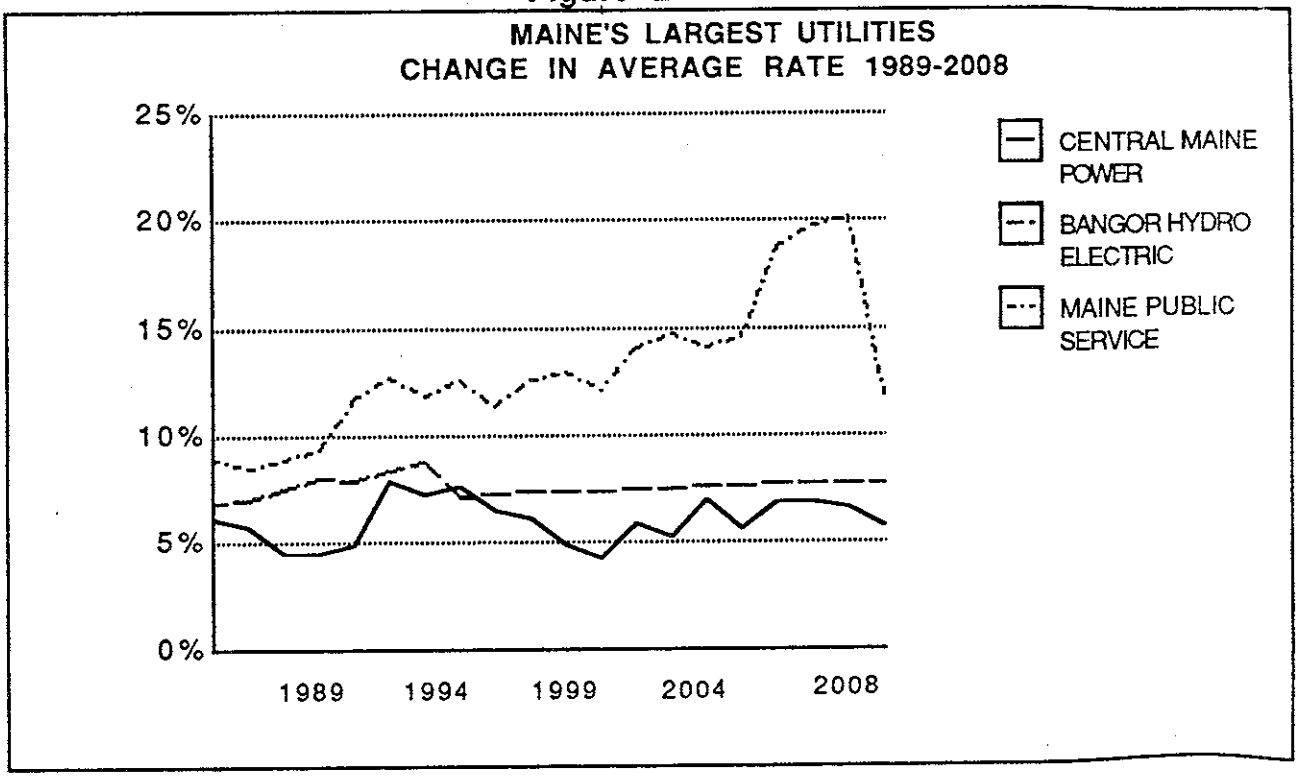
Regional economic impacts of an early shutdown of Maine Yankee would vary across the State. The rate impact of more expensive replacement power would vary by the level of dependence on Maine Yankee power and the location of energy-intensive businesses. Rates in Aroostook County would be most affected, because that region relies more heavily on Maine Yankee power than the rest of the State (45% in Maine Public Service territory compared to 22% Statewide). This heavier rate effect is of special significance to the Aroostook County economy where food processing, and paper production—electricity-intensive industries—play such a large role. Moreover, such a large rate impact would represent a significant cost increase, beyond increase projected to occur over the next twenty years, to all electricity consumers, especially small businesses, and low-income individuals.

The rate impacts for each of Central Maine Power, Bangor Hydro Electric, and Maine Public Service are illustrated in Figure 2, and shown in Table 3. The figures in this graph are uneven because of the timing and type of new capacity additions in each utility's hypothesized 30-year generation expansion plans. It should be noted that the graph in Figure 2 exhibits changes in average rates and <u>not</u> necessarily the retail rates established by the Public Utilities Commission. As was noted, Maine Public Service, and hence Aroostock County, is most vulnerable to the economic effects of a mandatory shutdown, as increases in electricity will reach as high as 20% by 2006. In contrast, the larger size and lower dependency on Maine Yankee of both BHE and CMP serve to moderate the rate impacts of an early shutdown, keeping them within the 5 to 9% range.

Table 3
CHANGE IN AVERAGE RATES FOR MAINE'S LARGEST UTILITIES IN THE CASE OF AN EARLY SHUTDOWN OF MAINE YANKEE

YEAR	CMP	BHE	MPS
1989	6.2%	6.9%	8.9%
1990	5.7%	7.0%	8.5%
1991	4.5%	7.6%	8.9%
1992	4.5%	8.0%	9.3%
1993	4.9%	7.9%	11.7%
1994	7.9%	8.4%	12.7%
1995	7.2%	8.7%	11.9%
1996	7.6%	7.1%	12.6%
1997	6.5%	7.2%	11.3%
1998	6.1%	7.3%	12.7%
1999	4.8%	7.4%	13.0%
2000	4.2%	7.4%	12.1%
2001	5.9%	7.4%	14.1%
2002	5.3%	7.5%	14.7%
2003	7.0%	7.6%	14.1%
2004	5.7%	7.6%	14.6%
2005	6.8%	7.7%	18.7%
2006	6.9%	7.7%	19.8%
2007	6.6%	7.8%	20.1%
2008	5.8%	7.8%	11.9%

Figure 2



The Maine Yankee Atomic Power Company provides about 290 full-time jobs. In addition, it is estimated that operation of the facility supports an additional 1000-1500 jobs around the State, including those related to maintenance during temporary shutdowns. Obviously, these jobs are concentrated in and around Wiscasset. Thus, an early shutdown would have a severe impact on the Town of Wiscasset and vicinity, reducing the Maine Yankee workforce to a skeleton crew and drastically reducing its contribution to the property tax base. It is important to note that these effects will occur in 2008 in any case. However, such a precipitous closing would prevent the area from taking any meaningful mitigating actions.

The distribution of economic benefits of additional domestic power production an early shutdown of Maine Yankee would also vary. Direct economic impacts will depend on the location of new power production facilities and on the location of fuel resources and available transmission lines. It is reasonable to expect these plants to locate primarily in northern, western, and eastern Maine, as these regions contain the bulk of Maine's wood and peat resources. Moreover, the majority of recent biomass power purchase agreements and proposed biomass facilities are located in eastern, central, and northern Maine.

Employment and income benefits of conservation projects are likely to be distributed around the State, but concentrated in Southern Maine. The indirect economic impacts of new domestic power production will also be more dispersed around the State.

DECOMMISSIONING COSTS

The 1986 Maine Yankee Shutdown Assessment estimated costs of $200,000,000 (in 1986 dollars) for dismantling and full decommissioning of the plant. Current industry estimates for decommissioning a plant such as Maine Yankee would likely be in the range of $190,000,000 to $210,000,000. This cost must be incurred at some time, regardless of the outcome of the referendum.

Some uncertainties persist in the factors which comprise decommissioning cost analyses, however. The Nuclear Regulatory Commission has, yet to release its revised Decommissioning Criteria for Nuclear Facilities, which were initially proposed in February, 1985. The State's future situation with respect to the January 1, 1993 deadline of the Low Level Radioactive Waste Policy Act (when the State must assume direct responsibility for all low-level waste in Maine) is uncertain. The future readiness of DOE to accept high-level waste shipments in 1998 remains questionable. Finally, Maine law, 35-A M.R.S.A. Subsection 4356 (6), provides that "assurance is needed that funds will be available for the cost of decommissioning which would occur if a nuclear power plant is prematurely closed," and 35-A M.R.S.A. Subsection 4356 (3) provides that if the Decommissioning Trust Fund is insufficient to decommission the plant, the licensee would be responsible for the deficiency. If the Company were unable to provide the full amount, the statute provides that owners would be jointly and severally responsible for the balance[19].

[19] A number of resource documents, representing a wide range of Maine Yankee decommissioning topics, has been compiled and is available at the Public Utilities Commission Information Resource Center.

4. HEALTH AND ENVIRONMENTAL ISSUES

The principle benefit of an early shutdown of Maine Yankee is the elimination of the risk of a catastrophic operations accident at that facility. The April, 1986 accident at the Soviet Union's Chernobyl-4 nuclear power station has heightened public concerns regarding the safety of nuclear power in general. A secondary benefit is the cessation of the production of low-level nuclear waste and spent nuclear fuel the Wiscasset facility.

Closing Maine Yankee eliminates the threats associated with an operating nuclear plant. Those associated with decommissioning and waste disposal remain, however. Moreover, sources of replacement power will, themselves, have significant environmental and health impacts.

OPERATIONAL SAFETY OF NUCLEAR POWER FACILITIES*

Throughout their life, American nuclear reactors release very small amounts of radioactivity which cause few adverse health impacts. The operating history of nuclear plants in the United States to date indicates to many that the risk of a serious nuclear accident is extremely small.

If a catastrophic accident were to occur, however, it would have lasting impacts on public health and safety, the environment and the economy. The most severe nuclear accident reported to date was the April, 1986 accident at the Chernobyl-4 nuclear power station in the Soviet Ukraine. That accident released over 100 million curies of radiation into the environment, resulted in the deaths of 33 workers and firemen, and may be a principal cause of many future radiation-related deaths. The Chernobyl accident required an evacuation of the population within 18 miles of the plant and over 50 miles downwind, dislocating 135,000 people. Soviet reports indicate that the area around Chernobyl will be uninhabitable for 4 years. The long-term effects of this

* For more detail regarding safety aspects of nuclear plant operation, see appendix.

radioactive contamination on the people, food chain, environment, and economy of the Chernobyl area or the Soviet Ukraine are still under examination and beyond the scope of current measurement.

Aspects of the Chernobyl Accident

In the past year, exhaustive studies of the April, 1986, accident at the Soviet Union's Chernobyl-4 nuclear power station have been conducted. The international scientific community continues its efforts to identify lessons from that accident for improving nuclear plant safety. Conclusions which have been drawn are similar, but recommendations based on those conclusions vary widely.

As the Soviet report, prepared for the International Atomic Energy Agency, stated:

> "The accident at Chernobyl was the result of coincidences of several events of low probability."[20]

Most published assessments concur with that statement, and go on to attribute specific causes of the accident primarily to the design of the Soviet reactor and to operator and procedural error.

System Design

The accident at Chernobyl-4 involved a Soviet-designed high-power, graphite-moderated boiling-water-cooled reactor, identified as the RBMK-1000 system. According to a compendium of U.S. assessments, this uniquely Soviet design evolved from early demonstration and plutonium production reactors. General characteristics of the RBMK and its predecessors include the use of graphite as a neutron moderator and light water as the coolant. Pressure tubes,

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[20] "The Accident at the Chernobyl' AES and its Consequences", U.S.S.R. State Committee for the Utilization of Atomic Energy. August. 1986.

contained in vertical channels in the graphite, either contain low-enriched uranium oxide fuel or are used as locations for control rods and instrumentation. The use of boiling water as a coolant in a pressure-tube, graphite-moderated reactor distinguishes the RBMK design from any other reactor design.

Operator and Procedural Error

Chronologies of the Chernobyl-4 accident reveal a number of operator and procedural errors that contributed to the accident, which occurred during the performance of a turbine generator test. The test procedures had not been adequately reviewed for safety. Management control of the performance of the test was not maintained, the test procedure was not followed, safety systems were bypassed, and control rods were operated incorrectly. Operators lost control of the reactor during the performance of the test.

Information available indicates that Chernobyl Unit 4 was one of the best of the 14 operating RBMK- 1000 units. The training and experience of the operating crew may have focused mainly on steady-state operation since the reactor operated continually as a base-loaded unit with on-line refueling. Evidently, there was very little, if any, training conducted on a plant simulator. Only one simulator at another site has been mentioned as possibly serving the training needs of operators of all 14 RBMK units.

The U.S. review concluded that the previous excellent performance created an attitude in plant personnel that close adherence to procedures was unnecessary; in effect, the previous trouble-free operation led to a dominating overconfidence.

An Industry View

The Atomic Industrial Forum, which refers to itself as "the association of the nuclear industry," stated in an annual overview of the state of that industry:[21]

> Chernobyl was the ultimate civilian nuclear disaster: It resulted in total destruction of a power reactor, widespread distribution of radioactive materials over a broad area of the globe, prompt fatalities, and the possibility of future health effects. The accident raised questions in the minds of public officials, and triggered a review of emergency procedures as well as a new look at some U.S. containment systems. In many countries, including the United States, Chernobyl was cited by some as a reason to close or delay startup of nuclear power plants.

AIF concluded, however, that "both the design characteristics of the Chernobyl-type reactor and the procedures followed by its operators combined to create a situation that would not be duplicated anywhere else in the world." The AIF statement continued by quoting the Association's President, Carl Walske:

> "Chernobyl enters the history books as the accident that proved the basic correctness of nuclear power design and operating decisions made in the West more than two decades ago. The major lessons of Chernobyl are to be learned by the Soviets."

Implications of the Chernobyl Accident

Conclusions drawn about causes of the accident at Chernobyl-4 in April, 1986, point to system design inadequacies, management breakdown, operator errors, procedural and training deficiencies, and equipment failures. Compounding factors were inattentiveness, low levels of diligence, and

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[21] "The Nuclear Industry in 1986: A Year of Incongruities", Info News Release. Atomic Industrial Forum, Inc., December 12, 1986.

overconfidence by responsible personnel, who tended to trust previous experience rather than carefully-developed procedure. Additionally, the simultaneous occurrence of a number of these factors was unanticipated or unforeseen in the development of planning scenarios on which Chernobyl-4 operations were based.

The conceptual problems stated above have some parallel outside the Chernobyl-4 experience. For example, the following inadequacies were identified in an Inspection and Enforcement investigation of the Three Mile Island 2 accident of March, 1979:[22]

> Perhaps the most disturbing result of the IE investigation is confirmation of earlier conclusions that the Three Mile Island Unit 2 accident could have been prevented, in spite of the inadequacies listed. The design of the plant, the equipment that was installed, the various accident and transient analyses, and the emergency procedures were adequate to have prevented the serious consequences of the accident, if they had been permitted to function or be carried out as planned... The results of the investigation make it difficult to fault only the actions of the operating staff. There is considerable evidence of a "mind set," not only by TMI operators but by operators at other plants as well, that overfilling the reactor coolant system (making the system solid) was to be avoided at almost any cost. Undue attention by the TMI operators to avoiding a solid system led them to ignore other procedural instruction and indications that the core was not being properly cooled. Without this "mind set" they might well have acted to preclude or better mitigate the accident.

The accidents at Chernobyl-4 and Three Mile Island 2 cannot be dismissed as totally unrelated. Clearly evident in reports of both of these incidents is the recurrence of the same generic operations failures,

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[22] Investigation into the March 29, 1979, Three Mile Island Accident by Office of Inspection and Enforcement", Investigative Report No. 50-320/79-10, NUREG-0600, U.S. NRC, August. 1979.

accompanied by recommendations and cautions that these failures be addressed in future operations throughout the power industries.

Federal Preemption

One complication of the extension of experience, or "lessons learned", to improve safety or efficiency at nuclear power stations is federal preemption, which in some critical areas removes state officials from direct jurisdiction over, or perhaps even knowledge of, safety matters. A former Maine Chairman of the Public Utiliites Commission, who was a member of the Nuclear Regulatory Commission during the Three Mile Island 2 incident, has described this dilemma:[23]

> "The consequences of the preemption of the states from nuclear safety decision-making came home to roost in the aftermath of Three Mile Island. ... At the point at which the federal regulators and the utility were confounded by puzzling and dangerous events, [Pennsylvania's] Governor Thornburgh was called upon to make the first nuclear power plant safety decision ever entrusted to a state official - whether or not to evacuate the surrounding population."

In this respect it may be noted that the Maine Legislature recently enacted legislation creating a State program for the monitoring of safety at Maine Yankee. P.L. 1987, c. 519 (AN ACT To Establish a State Nuclear Safety Inspection and Monitoring Program for Commercial Nuclear Power Facilities in the State).

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[23] Address by Peter A. Bradford, Chairman, Maine Public Utilities Commission, to the Nuclear Plant Safety and Reliability Seminar, Valley Forge, PA. January 22, 1987.

ENVIRONMENTAL IMPACT OF CLOSING MAINE YANKEE

Decommissioning and Nuclear Waste Disposal

As noted in the 1986 report, final dismantling of Maine Yankee will involve the handling of large amounts of radioactive waste. The NRC currently recognizes three decommissioning methods - complete dismantling and removal, in-place encapsulation ("entombment" and mothballing), or a combination of these methods. Maine Yankee currently proposes to use the complete dismantling and removal method. However, uncertainties persist as to the future readiness of U.S. D.O.E. to accept high-level waste shipments, and to Maine's future responsibility for low-level waste produced in the State.

As a result of these uncertainties, the timing of any Maine Yankee decommissioning, which of necessity must await sites for low-level and high-level waste, is difficult to project. Indeed, Maine Yankee may become an interim high-level waste and spent fuel repository, as well as a low-level waste site, for an indefinite period, depending on developments in these areas and the effect of 35-A M.R.S.A. Subsection 4371 (discussed earlier). Although not a preferred or even desirable method, long term on-site waste management has been reviewed by Maine Yankee. If this occurs, it will happen irrespective of the referendum's outcome, since Maine Yankee's high-level waste must be disposed of.

Industry experience is rapidly evolving and is scheduled for review in an International Decommissioning Symposium in October. This session, sponsored by DOE, the International Atomic Energy Agency, and the Nuclear Energy Agency of the Organization for Economic Cooperation and Development, is a follow-up to a DOE symposium in 1982.

Impacts of Replacement Power

Replacing power from Maine Yankee will also entail a range of environmental and health impacts. Importation of Canadian power from Hydro Québec will require the construction of a large high-voltage transmission line

from the Québec border to CMP facilities in Maine. The construction of a transmission line through western Maine presents several environmental issues including soil erosion, impacts on fish and wildlife habitat, existing land uses, recreation, water quality, and scenic quality.

In addition, operating alternating current (AC) lines have raised questions about potential impacts on human health and welfare. Concerns have been raised in other states about the health risks of extremely low frequency (ELF) fields associated with AC power lines. To date, analyses on this health effect are inconclusive.[24]

Constructing and operating several small power plants and hydro facilities will have significant environmental consequences, as well. Among these are the impacts of transmission line siting, air emissions, biomass harvesting, disposal of ash, and damming of rivers.

Biomass fired power plants consume large quantities of biomass and process water, and generate ash and various air pollutants. Resource consumption, ash generation, and air emissions will vary with the size of the plant and the particular fuel mix burned. The use of significant amounts of coal or oil would require environmental controls to reduce the sulfur dioxide and nitrogen oxide emissions to allowable levels. However, substitution of biomass for oil may reduce some of the emissions, as is the case with the Boise-Cascade cogeneration facility in Rumford.

These impacts and other plant construction, operation, and siting considerations raise numerous environmental issues. Of special note is the fact that coal and municipal waste ash, unlike wood and peat, contain heavy metals, which may reduce available disposal options.

The total wood biomass harvest needed to fuel these plants is approximately 4 million tons per year. This will come from a combination of sawmill residues, the limbs and tops of trees cut for pulp or sawlogs, and whole

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[24] For more details, see Preliminary Report on the Effects of the Proposed Purchase of Power from Hydro Québec. Maine State Planning Office. May, 1987.

trees cut exclusively for fuel (these trees are usually cut in the same area as trees for sawlogs and pulp in order to minimize yarding and transportation costs). These amounts would be in addition to any currently-contracted biomass or cogeneration facilities. Best estimates are that this additional demand would approximately double existing whole-tree harvest activities.

Current and planned demand for wood from Maine's forests is still being examined by the Department of Conservation and others. Until these studies are complete, it is impossible to be certain what the impacts of additional whole tree harvesting will be. However, it is possible that the additional demand from these biomass plants could cause demand to exceed growth, and, absent any efforts to increase the yield of our forests, could result in depletion of the resource over a long period of time. It is more likely, however, that increased demand would stimulate efforts at increasing supply.

Whole tree harvesting is thought by some to have potentially harmful effects on the surrounding ecosystem. Of major concern is the potential for depletion of nutrients from the forest soil due to the removal of large quantities of biomass that would otherwise naturally decompose and restore nutrients to the soil. There is also concern that there would be adverse impacts from improper harvesting practices on wildlife population and habitat (especially from clearcut operations) damage to trees left on the site, or damage to the site itself. However, many forestry experts believe that these adverse impacts can be mitigated. What will be more difficult to mitigate will be the creation of access roads and other lumbering infrastructure which will result from a doubling of present harvest levels.

Peat use as a biomass fuel raises unique environmental concerns. Unlike wood, peat is a non-renewable resource. Efforts are now underway to inventory the many peat bogs in Maine to determine those that contain unique natural occurrences which may require special protection. Maine's first peat-fired power plant is currently under construction in Washington County. This 24 MW facility will burn up to 164,000 tons of peat per year. Wood chips will be used to supplement the peat fuel. A closed loop cooling water system which extracts water from the peat itself will minimize water supply needs. Exhaust heat from the boilers and steam turbines will be used to dry the peat during

processing and storage. Up to 5,000 tons of peat ash will be generated on an annual basis.

Hydropower projects use the potential energy of falling water as an indigenous and renewable source of electric power generation. Generally speaking, hydropower projects do not discharge "pollutants" to the air, land, or water. However, hydro projects can significantly affect various public resources, and numerous environmental issues related to the construction, operation, and siting of these facilities are raised and addressed in the permitting process.

It is not clear how viable new hydropower is in Maine. Surveys of existing and potential hydroelectric sites indicates that significant hydro potential exists. However, recent responses to CMP requests for power purchase proposals, however, included only 1 MW of hydroelectric power. This would seem to indicate that new hydro in Maine is simply not competitive with fossil fuel alternatives, and certainly not with Hydro Québec.

5. CONCLUSIONS

Comparing the risk and consequences of a catastophic nuclear accident against the economics of increased energy costs presents a formidable challenge. A 1982 report conducted for the Nuclear Referendum Committee stated:

> "On the one side of the debate...are those who emphasize risks and uncertainties of continued nuclear operation. But it is difficult to persuasively quantify the probabilities and the human and economic impacts of catastrophic events...nuclear risks versus nuclear substitution economics—cannot at this time be recast into a common measure and compared with one another in a noncontroversial social cost/benefit assessment...In defining positions on the plant shutdown issue, quantitative analysis will continue to be supplemented by subjective perceptions and nomative judgments..."[25]

Quantifying the economic costs and benefits of an early shutdown, as provided in Section 3, is an effort to put this complex issue into perspective. The actual costs of replacing Maine Yankee could vary considerably from the figures provided here. Of particular importance to the costs of replacing Maine Yankee are 1) the price of replacement power, which, over the short term, will vary directly with the price of oil and, which, over the long term, may or may not be priced competitively with the Hydro Québec proposal, 2) the actual cost of operating Maine Yankee over the next 20 years, and in particular its power output, as the plant ages, and 3) the basis upon which the owners of the facility will be compensated, if compensation is required.

Whatever the actual costs of replacing Maine Yankee power, certain things are clear. First, replacing Maine Yankee with other sources of generation will come at a high cost to Maine ratepayers. Instead of being used to displace expensive and unstable oil-fired generation, these sources will replace less

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25 "The Impacts of Early Retirement of Nuclear Power Plants: The Case of Maine Yankee", Raskin, P.D.; Rosen, R.A.; Energy Systems Research Group. August, 1982. p.2.

expensive nuclear power, and, at least in the short term, increase the State's vulnerability to the vagaries of international petroleum markets.

Second, the outcome of the referendum will have no impact on the selection of Maine as a high-level nuclear waste site. As noted in the 1986 report to Governor Joseph Brennan, there is a tenuous connection, if any, between the production of nuclear waste at Maine Yankee and Maine's selection by the U.S. Department of Energy (DOE) as a potential high-level waste site. Further, Congressional approval of a Senate measure limiting the number of high-level nuclear waste sites to one, would remove the threat that Maine will become a high-level waste site. This bill would not eliminate the issue of nuclear waste disposal, only the threat that Maine will be selected by DOE.

Third, the outcome of the referendum will not change Maine's responsibility for low-level nuclear waste. Under the Low Level Nuclear Waste Policy Act of 1980, as amended, all states must take responsibility for the disposal of low-level nuclear waste generated in the state by 1993. In 1987, through the work of the Maine Advisory Commission on Radioactive Waste, the Maine Low-Level Radioactive Waste Authority was established to meet our federal requirements. The Commission and the new authority are seeking arrangements for out-of-state waste disposal. If it is unable to make suitable arrangements, the Authority must develop an in-state low-level nuclear waste facility. Building any such facility in Maine is expected to cost up to $10 million. Funds to plan and build a disposal facility are to be raised through an assessment against Maine Yankee between 1988 and 1992. While the cost of out-of-state disposal is unknown at this writing, it is expected to be less than the costs of an in-state facility.

According to a survey conducted by the Department of Environmental Protection, Maine Yankee produces the bulk of the low-level nuclear waste shipped from Maine. Currently, many smaller generators of low-level waste in Maine store it on site until it has decayed to less dangerous levels. While an early shutdown of Maine Yankee will greatly reduce the amount of such waste generated in Maine, it is not clear how this would affect Maine's waste disposal needs in the late 1990s and beyond. This question is muddied by further

uncertainties, e.g., whether Maine can find an adequate out-of-state disposal option, how smaller waste generators dispose of future waste, and whether waste generated by Portsmouth Naval Shipyard is to be a State or federal responsibility.

The numerous issues surrounding nuclear safety, and Maine's long term energy needs are as complex as they are compelling. Whatever its outcome, the 1987 referendum will touch the lives of every Maine citizen. It is crucial that a decision so critical to our future be based upon as clear an understanding of its consequences as possible, tempered by an appreciation for the great gaps in our knowledge and predictive powers.

APPENDICES

Appendix 1 Memorandum from Stephen G. Ward, Public Advocate to the Maine Yankee Study Group Providing the Maine Yankee Legal Analysis

Appendix 2 Maine Public Utilities Commission Staff Estimates of Annual Costs to Replace Maine Yankee Power, 1989-2008

Appendix 3 Memorandum from Joseph Sukaskas to Richard Parker, Maine Public Utilities Commission Regarding Nuclear Safety and Decommissioning Issues

Appendix 1

Memorandum from Stephen G. Ward, Public Advocate, to the Maine Yankee Study Group Providing the Maine Yankee Legal Analysis

John R. McKernan, Jr.
Governor

Stephen G. Ward
Public Advocate

Executive Department
PUBLIC ADVOCATE
Telephone (207) 289-2445

TO: Maine Yankee Study Group

FROM: Stephen G. Ward, Public Advocate

DATE: September 17, 1987

RE: Maine Yankee Legal Analysis

I am providing the legal analysis for the 1987 Study, with minor changes to the August 15 draft based on comments received from interested parties.

A. Introduction

Unlike prior referenda in Maine seeking the shutdown of Maine Yankee, the current proposal does not narrowly address the question of economic and safety consequences from continued plant operation; it also targets the risk of nuclear waste generation and the associated problems of disposal of high-level radioactive waste. Although in each case, current and prior referenda proposals have incorporated economic arguments for a Maine Yankee shutdown, the 1987 referendum for the first time will broaden the scope of the debate to include high-level waste disposal, as well as the danger of operator error or plant malfunctions.

In conjunction with DOE's review of in-state sites for a high-level waste repository, these additional health and safety issues in

the 1987 referendum debate will inevitably draw attention to a central legal question: what authority exists under current federal and state law for Maine to order a nuclear plant shutdown on grounds including the public health and safety? Although this issue was examined in the Governor's 1986 Maine Yankee shutdown assessment,[1] it deserves reexamination in light of several recent United States Supreme Court decisions pertaining to the issues of federal pre-emption and just compensation for a forced closure of Maine Yankee.

This section of this 1987 report will examine the central question of state authority to compel a Maine Yankee shutdown and then will turn to the subsidiary questions of fair compensation to the plant's owners in the event that the state does possess such authority.

B. Preemption

In a government of laws, such as ours, the enactment of a state law will be assessed in terms of its potential for conflict with existing federal law, under established court precedents. One of the primary tests which a newly-enacted state law must pass is to demonstrate that it does not violate any provision of the federal

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[1] The "Staff Papers and Correspondence" appendix to the previous State Planning Office May, 1986 report includes an April 2, 1986 letter from the Attorney General's office which commented that "to the extent that state action is not motivated by safety or technological considerations of a nuclear power plant, it will not be preempted by the Atomic Energy Act", concluding that the U. S. Supreme Court's application of the preemption doctrine "will occur on a case-by-case basis".

Constitution. The 1987 Maine Yankee referendum raises questions in several areas regarding possible conflicts with the United States Constitution and in particular the Supremacy Clause,[2] the Commerce Clause,[3] and the Contract Clause.[4] In the latter case, parallel questions may arise under related provisions of the Maine Constitution.

When a state law or regulation introduces inconsistent requirements in an area already subject to federal legislation, the federal courts evaluate the necessity of preempting the state law under the long-lived doctrine of federal preemption. The United States Supreme Court[5] recently provided a summary of this doctrine:

> "The Supremacy Clause of Art. VI of the Constitution provides Congress with the power to pre-empt state law. Pre-emption occurs when Congress, in enacting a federal statute, expresses a clear intent to pre-empt state law, Jones v. Rath Packing Co., 430 U.S. 519 (1977), when there is outright or actual conflict between federal and state law, e.g., Free v. Bland, 369 U.S. 663 (1962), where compliance with both federal and state law is in effect physically impossible, Florida Lime & Avocado Growers, Inc. v. Paul, 373 U.S. 132 (1963), where there is implicit in federal law a barrier to state regulation, Shaw v. Delta Air Lines, Inc., 463 U.S. 85 (1983), where Congress has legislated comprehensively, thus occupying an entire field of

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2 Article IV: "This Constitution, and the laws of the United States which shall be made in Pursuance thereof...shall be the supreme law of the Land".

3 Article I, Section 8: "The Congress shall have Power...to regulate commerce with foreign nations, and among the several States, and with Indian tribes".

4 Article I, Section 10: "No State shall...pass any...law impairing the obligation of contracts".

5 Louisiana Public Service Commission v. FCC, ___US___, slip. op. at 12, 5/27/86.

> regulation and leaving no room for the States to supplement federal law, Rice v. Sante Fe Elevator Corp., 331 U.S. 218 (1947), or where the state law stands as an obstacle to the accomplishment and execution of the full objectives of Congress. Hines v. Davidowitz, 312 U.S. 52 (1941). Pre-emption may result not only from action taken by Congress itself; a federal agency acting within the scope of its congressionally delegated authority may preempt state regulation. Fidelity Federal Savings & Loan Assn. v. De la Cuesta, 458 U.S. 141 (1982); Capital Cities Cable, Inc. v. Crisp, 467 U.S. 691 (1984)."

In the context of the 1987 Maine Yankee referendum, there are a number of federal statutes which may conflict with, and conceivably preempt, a state law prohibiting the generation of high-level nuclear waste.[6] These include: the Atomic Energy Act of 1954, which conferred on the Atomic Energy Commission and, in 1974, its successor the Nuclear Regulatory Commission responsibility for licensing, monitoring and regulating "the construction or operation of any production or utilization facility" involving radiation hazards; the Nuclear Waste Policy Act of 1982[7] which confers on the Department of Energy responsibility for locating, constructing and operating radioactive waste disposal facilities; and the Federal Power Act[8] which assigns to the Federal Energy Regulatory

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6 42 USC 2011-2282, as amended in 1959 at 42 USC 2021 and in 1974 by the Energy Reorganization Act at 42 USC 5801-5891.

7 42 USC 10101 et seq..

8 18 USC 824 et seq. Insofar as the Maine Yankee Atomic Power Company is subject to wholesale rate regulation by FERC in Washington, the forced closure of the plant under state law would presumably require FERC approval for an abandonment of service to wholesale customers, 35 of which are located in states other than Maine.

Commission responsibility for regulating wholesale sales of electricity in interstate commerce.

Courts both in Maine and elsewhere have evaluated federal preemption issues in the context of newly-enacted state laws. In Maine for example, a recent severance pay law in the case of manufacturing plant closings was recently upheld both by the Maine and United States Supreme Courts, notwithstanding issues of federal preemption. In both cases, the courts concluded that the federal jurisdiction of the National Labor Relations Board did not preempt the Maine law, given state interests in preventing economic dislocation due to plant closings.[9] No Maine court to date has reviewed the question of state authority to regulate radioactive waste generation in the context of the three federal laws referred to earlier.

In a number of federal and state courts elsewhere, however, this issue has received a close examination with the consistent result that such state authority has been found preempted and therefore unconstitutional under the Supremacy Clause.

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9 Director of Bureau of Labor Standards v. Fort Halifax Packing Co., 510 A.2d 1054 (Me 1986), cert. den., ___US___1987 but see Bayside Enterprises Inc. v. Maine Agricultural Bargaining Board, 513 A.2d 1355 (Me 1986) where Maine law found preempted by the federal Agricultural Fair Practices Act.

Specific cases considering the generation or disposal of nuclear waste include:

A. Atomic Energy Act of 1954

1. Northern States Power Co. v. State of Minnesota, 447 F.2d 1143, 1154 (8th Cir., 1971): "Accordingly, for the reasons stated, we hold that the federal government has exclusive authority under the doctrine of preemption to regulate the construction and operation of nuclear power plants, which necessarily includes regulation of the levels of radioactive effluents discharged from the plant" (Minnesota emissions regulation, although more stringent than NRC regulation and therefore permitting dual compliance with both state and federal law, found preempted under the Atomic Energy Act);

2. Train v. Colorado Public Interest Research Group 426 US 1, 15 (1975): Atomic Energy Commission retains "full authority to regulate materials covered by the [Atomic Energy Act], unaltered by the exercise of regulatory authority under the Federal Water Pollution Control Act", citing Northern States Power Co. v. State of Minnesota as affirmed "summarily" by the U.S. Supreme Court at 405 US 1035 (1972);

3. United States v. City of New York, 643 FS 604, 612 (SDNY, 1978): a city's attempt to prohibit operation of a university research reactor for safety reasons found preempted under 42 USC 2021 due to the NRC's "radiological regulation of the operation of nuclear reactors";

4. Commonwealth Edison Co. v. Pollution Control Board 284 NE.2d 342 (Il1, 1972): Illinois statute regulating levels of radioactive discharges found preempted by the Atomic Energy Act in state court;

5. New Jersey Department of Environmental Protection v. Jersey Central Power and Light Co., 351 A.2d 337 (NJ, 1976): New Jersey court finds state regulation of power plant emissions preempted by the Atomic Energy Act;

6. People of the State of Illinois v. Kerr-McGee Chemical Corp. 677 F.2d 571, 581 (7th Cir. 1981): "In line with the opinions in Northern States and Pacific Legal Foundation, we hold that the Atomic Energy Act has expressly and impliedly preempted regulation by the states of the radiation hazards associated with nuclear materials". [10]

B. Federal Power Act of 1935

1. Mississippi Industries v. FERC, 802 F.2d 1525 (DC Cir, 1987): a state challenge to FERC's reallocation of nuclear power plant costs among utilities in a holding company system is rejected due to FERC jurisdiction over sales of wholesale electricity in interstate commerce;

2. State of Minnesota v. FERC, 734 F.2d 1286 (8th Cir, 1984): Minnesota PUC challenge to a holding company cost sharing agreement is rejected due to FERC jurisdiction under the Federal Power Act;

3. Nantahala Power and Light v. Thornburg, ___US___ 1986, 74 PUR 2.d 464, 465 (1986): "FERC's allocation of entitlement power to Nantahala is therefore reflected in Nantahala's filed [wholesale] rates. [The North Carolina Utilities Commission]

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10 Also see Brown v. Kerr-McGee Chemical Corp., 767 F.2d 134 (7th Cir, 1985) where state authority over the movement of radioactive materials is found preempted under the Atomic Energy Act; a similar conclusion is possible in the case of state authority in the context of the Nuclear Waste Policy Act of 1982.

cannot substitute its own conception of what allocation of entitlement power would have been memorialized in a fair Apportionment Agreement simply because FERC did not approve the Apportionment Agreement without qualification".

4. Federal Power Commission v. Southern California Edison Co., 376 US 205, 215-16 (1964): "...Congress meant to draw a bright line easily ascertained, between state and federal jurisdiction, making unnecessary such case-by-case analysis. This was done in the [Federal] Power Act by making the FPC's [now FERC] jurisdiction plenary and extending it to all wholesale sales in interstate commerce except those which Congress has made explicitly subject to regulation by the states".

Based on these numerous precedents under two distinct theories of federal preemption,[11] there exists considerable doubt as to whether enactment of the 1987 Maine Yankee referendum could survive legal challenges in federal court.

For the 1987 referendum to survive such challenges, the State of Maine will have to demonstrate that the forced closure of Maine Yankee does not frustrate achievement of Congress' full purposes and objectives in enacting the Federal Power Act, the Atomic Energy Act or the Nuclear Waste Disposal Act.[12] Nor that Congress has

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[11] The theories can be stated: the Atomic Energy Act at 42 USC 2018, 2021(c)(1) and 2021(K) preempts state regulation of nuclear power safety and radiation hazards; the Federal Power Act at Sections 205 and 206 preempts state regulation over wholesale sales of electricity in interstate commerce.

[12] See International Paper Co. v. Ouelette, ___US___, slip. op. 1/21/87, 55 LW 4138, 4142 (1987).

has demonstrated a "clear and manifest purpose" to supercede state regulation.[13] Finally, the State of Maine will have to demonstrate the possibility that Maine Yankee simultaneously can comply both with the newly-enacted state law and existing federal laws and regulations.[14] A recent U.S. Supreme Court case provides precedent for state regulation of nuclear power which is found not to be preempted by federal law, and therefore deserves specific mention.

In Pacific Legal Foundation v. State Energy Resources, 659 F.2d 903 (9th Cir, 1981) a Federal Court of Appeals found that a California law imposing strict preconditions on the siting of new nuclear power plants in that state does not violate the Supremacy clause, on the grounds that "inherent in the state's regulatory authority is the power to keep [new] nuclear plants from being built"...Id at 926. This decision was upheld by the U.S. Supreme Court in Pacific Gas and Electric Co. v. State Energy Resources Commission, 461 US 190 (1983) with that court noting at several points that state authority over planning for new power plants and over ratemaking was not at issue. Id at 207, 209. However, the Supreme Court directly-and without dissenting opinions--addressed the issue of state regulation of nuclear safety and hazardous waste disposal:

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13 See California Federal Savings and Loan Assoc. v. Guerra, ___US___, slip. op. 1/17/87, 55 LW 4077, 4082.

14 See Florida Lime and Avocado Growers, Inc. v. Paul, 373 US 132 (1963).

> At the outset, we emphasize that the [California] statute does not seek to regulate the construction or operation of a nuclear power plant. It would clearly be impermissible for California to attempt to do so, for such regulation, even if enacted out of non-safety concerns, would nevertheless directly conflict with the NRC's exclusive authority over plant construction and operation. Respondents appear to concede as much. Respondents do broadly argue, however, that although safety regulation of nuclear plants by states is forbidden, a state may completely prohibit new construction until its safety concerns are satisfied by the Federal government. We reject this line of reasoning. State safety regulation is not preempted only when it conflicts with federal law. Rather, the Federal government has occupied the entire field of nuclear safety concerns, except the limited powers expressly ceded to the states...A state moratorium on nuclear construction grounded in safety concerns falls squarely within the prohibited field. Moreover, a state judgment that nuclear power is not safe enough to be further developed would conflict directly with the countervailing judgment of the NRC...that nuclear construction may proceed notwithstanding extant uncertainties as to waste disposal. A state prohibition on nuclear construction for safety reasons would also be in the teeth of the Atomic Energy Act's objective to insure that nuclear technology be safe enough for widespread development and use - and would be preempted for that reason. Id at 212-213. (emphasis added)

There can be little question that a state law closing a nuclear plant due to waste disposal and safety concerns would be found unconstitutional based on the Pacific Gas and Electric analysis, unless Congress itself amended the Atomic Energy Act to authorize state safety regulation of nuclear power. In the event that the 1987 Referendum were perceived, presented and defended as a reasonable effort to regulate nuclear power plant operation for reasons other than public health and safety, the outcome is less clear. It is, however, a fair statement that the weight of authority supports the probable preemption of the 1987 Referendum under either the Atomic Energy Act of 1954, or the Federal Power Act.

C. Commerce Clause and Contract Clause Concerns

Federal constitutional prohibitions against interference with interstate commerce or against state laws impairing existing contracts pose a broad range of questions whose answers are not as easily determined as is the case for federal preemption. In the case of unconstitutional interference with interstate commerce, the Federal Power Act cases referred to above also comprise authority for Commerce Clause violations. In a 1970 decision, Pike v. Bruce Church, 397 US 137, 142 (1970), the U.S. Supreme Court enunciated a balancing test for determining when state regulation of interstate commerce exceeds the limits of the Commerce Clause:

> "where the [state] statute regulates evenhandedly to effectuate a legitimate local public interest and its effects on interstate commerce are only incidental, it will be upheld unless the burden imposed on such commerce is clearly excessive in relation to the putative local benefits...And the extent of the burden that will be tolerated will of course depend on the nature of the local interest involved, and on whether it could be promoted as well with a lesser impact on interstate activities.

Given 50% ownership of Maine Yankee by out-of-state utilities, it will be difficult to characterize the closure of the plant as having only an "incidental" effect on interstate commerce.

However, enactment of the 1987 Referendum cannot be characterized as an effort to secure for Maine citizens and ratepayers an economic advantage at the sole expense of out-of-state

citizens or ratepayers; fully 50% of the costs of replacement power plus 100% of any constitutionally required compensation to Maine Yankee's owners will ultimately be borne by Maine citizens alone. Hence, in this respect, the Referendum's enactment would not interfere with interstate commerce to the extent of causing citizens elsewhere to bear all costs, with consequent benefits to be received solely by Maine citizens.[15]

The question of excessive burdens on interstate commerce also generates a related concern: can the local interests of opposing the siting in Maine of a nuclear waste facility or of halting the in-state generation of nuclear waste be promoted by methods which have a "lesser impact" on interstate commerce? Resolution of these issues, and application of the Pike v. Bruce Church balancing test, will necessarily await actual litigation in the event that the 1987 Maine Yankee referendum is enacted.

As with the analysis of Commerce Clause violations, the constitutionality of a state law under the Contract Clauses of the Maine or United States Constitutions requires demonstration of a substantial public purpose.[16] As stated by the U.S. Supreme

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15 See North Western Portland Cement v. Minnesota, 358 US 450, 457 (1959). A court, of course, could determine that the replacement power costs imposed on out-of-state ratepayers in and of themselves impose an excessive burden on interstate commerce, notwithstanding the significantly greater costs also imposed on Maine ratepayers and taxpayers.

16 The Maine Constitution at Article I, Section 11 states: "The Legislature shall pass no...law impairing the obligation of contracts".

Court in Energy Reserves Group, Inc. v. Kansas Power and Light Co., 459 US 400, 411-12 (1983), an unconstitutional impairment of contract requires a showing first that impairment is substantial, also that there is no "significant and legitimate" public purpose and finally that the resulting adjustment of contract rights is unreasonable. Federal and State courts have found constitutionally sufficient public purposes in state laws which:

1) prohibited the sale of milk in plastic milk containers, given state interests in renewable sources and in energy conservation -- Minnesota v. Clover Leaf Creamery Co., 449 US 456 (1981);

2) required the local registration of securities offerings -- Hall v. Geiger-Jones Co., 242 US 539 (1917);

3) regulated freighter emissions notwithstanding Coast Guard licensing of ships -- Huron Portland Cement Company v. Detroit, 362 US 440 (1960);

4) established municipal woodyards for the distribution of firewood -- Laughlin v. City of Portland, 90 A 318 (Me 1914).

The breadth of these examples of permissible public purposes under the Commerce or Contract Clauses illustrates the difficulty of predicting how the courts would evaluate the legitimacy of the purposes underlying the 1987 Referendum. As noted by the Maine Law Court in a 1977 case, the "freedom to contract is necessarily subject to reasonable police power measures intended to promote and preserve the welfare of citizens". National Hearing Aid Centers v.

Smith, 376 A.2d 456, 461 (Me 1977). This is particularly true of contracts among regulated utilities for the generation of electricity where contract terms rountinely are conditioned on continued regulatory approval and oversight.[17]

The reasonableness of methods selected by the state for implementing a legitimate public purpose is the remaining major component in the constitutional analysis required under the Pike v. Bruce Church and Energy Reserves decisions for the Commerce Clause and Contract Clauses, respectively. The Maine Law Court that "the methods adopted by the Legislature" need not "be the best or wisest choice...if the measure is reasonably appropriate to accomplish the intended purpose". National Hearing Aid Centers at 461. However, state action will be ruled overburdening unless the local interest simply cannot be served by any less disruptive or burdensome alternative.[18] Here again, the rationale for the 1987 Referendum is crucial. Given the inaction of Congress in resolving radioactive waste siting controversies generated by the Nuclear Waste Policy Act of 1982, the courts will determine if less disruptive or burdensome

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17 This point is further amplified in a December 4, 1984 Attorney General letter opinion which examined the specific contract provisions of the Seabrook Joint Ownership Agreement (JOA) and found that a Maine Public Utilities Commission order requiring Maine's Seabrook owners to disengage from that project would "not violate the reasonable expectations of the parties to the JOA, and would not be found to 'impair' the contract, in the constitutional sense at all."

18 Edgar v. Mite Corporation, 457 US 624 (1982) where a state law requiring tender offers anywhere in the country be registered in Illinois was struck down notwithstanding its protection of local investors from corporate take-over. Also see Hunt v. Washington Apple Advertising Commission, 432 US 333 (1977).

alternatives exist to the outright closing of Maine Yankee under state law. To the extent that the fundamental rationale of the 1987 Referendum is presented instead as a purely economic matter, focusing hypothetically on alleged losses on property values near the Wiscasset reactor, a court will evaluate an entirely different set of alternatives to plant closure - such as general fund compensation for affected property owners. If the burden on interstate commerce, or interference with the contract rights of Maine Yankee's owners and customers, is found to be excessive, the 1987 Referendum will be ruled unconstitutional on either or both of these grounds.

D. Just Compensation under the Fifth Amendment

Both the Maine and United States Constitutions provide assurance that private property may not be taken without a public purpose and without payment of just compensation.[19] These Constitutional guarantees, as well as the state and federal court cases interpreting them, hinge on three successive issues: when does the State have power to take private property? If such power is lawfully used, does the State owe compensation? By what measure of value must compensation be awarded? Each of these questions presents different issues for consideration in the context of a forced shut down of the Maine Yankee power plant.

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[19] Article I, Section 21 of the Maine Constitution provides: "Private property shall not be taken for public uses without just compensation; nor unless the public exigencies require it" The Fifth Amendment of the U.S. Constituion reads in part: "...nor shall private property be taken for public use, without just compensation".

1) State Power To Take Control Use of Private Property

A state typically exercises its power to control the use of private property by regulating the use of the property. Sometimes the control is achieved in a manner that constitutes a taking of the private property. A taking may also be accomplished overtly by means of eminent domain authority. The use of these extraordinary powers has prompted numerous courts to caution that considerable care is necessary to evaluate whether compensation is owed at all. For example, the Maine Law Court has stated in this context: "Before legislation may be declared in violation of the Constitution, that fact must be established to such a degree of certainty as to leave no room for reasonable doubt". Orono-Veazie Water District v. Penobscot County Water Company, 348 A.2d 249 (Me 1975). Furthermore, there is considerable Maine and U.S. Supreme Court precedent for the proposition that, when the state properly exercises its police powers, the complete elimination of a non-conforming business may not create a compensable loss under the Fifth Amendment or its state constitutional equivalent.[20]

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20 Hadacheck v. Los Angeles, 239 US 394 (1915), zoning ordinance shuts down brickyard; Mugler v. Kansas, 123 US 623 (1887), brewery closed by Prohibition Law; Reinman v. Little Rock, 237 US 171 (1913), livery stable closed as a nuisance. Also see, Shapiro Brothers Shoe Co. v. Lewiston-Auburn, 320 A.2d 247 (Me. 1974), severance pay required; State v. Lewis, 406 A.2d 886 (Me. 1979), junkyard closed; State v. McKinnon, 133 A.2d 885 (Me 1955), game preserve created; Jones v. Polland, 93 A.2d 41 (Me. 1915), aff'd 245 US 217 (1917), fuel yard created; Wadleigh v. Gilman, 12 Me. 403 (Me. 1835) wooden structures prohibited. In none of these cases did the Fifth Amendment or Maine constitution require the payment of compensation.

While there must be a public use to justify a state taking, the U.S. Supreme Court has stated that it is proper to defer to the Legislature (or in the case of the 1978 Referendum to the voters) in determining whether the public use is a reasonable one. Hawaii Housing Authority v. Midkiff 467 US 229, 244 (1984). Under current Fifth Amendment standards, it appears that as long as the public use merely represents a "conceivable public purpose", a state will satisfy the threshold public purpose requirement. Id. at 241. Assuming the Referundum survives constitutional challenge under the Supremacy, Commerce, and Contract Clauses, it appears likely that the 1987 Referendum would pass this threshold test, i.e., that the Referendum would be found to reflect a reasonable public purpose so as to justify state control of the use of the property. The question then becomes whether the exercise of the control constitutes a taking or merely a reasonable regulation of use.

2) Compensation Due only when a Taking has Occurred

Just compensation is owed only in circumstances where the courts find that a constitutional taking has occurred. The courts' inquiry will necessarily be ad hoc and circumstantial and involves no pat formula. Connolly v. Pension Benefit Guaranty Corp., 106 S. Ct. 1018, 1026 (1986). No taking occurs, or is compensation owed, unless the state interferes with distinct investment-backed expectations to a major and unsupportable degree. Penn Central Transportation Corp. v. New York City, 98 S. Ct. 2646, 2659 (1978). Recent Maine Law Court decisions go futher: just compensation may be due only in cases where the market value of the condemned

property has been reduced to zero. Due to the fact that the affected property retained rental income potential or could be sold, the Law Court concluded that no taking had occurred in a recent case:

> It is clear from the preponderance of the believable evidence that beneficial and valuable uses of their property remain available to the Halls despite the denial of a building permit by the B.E.P. Accordingly, we hold that there has been no taking of the Hall property in violation of article 1, section 21 of the Maine Constitution. Hall v. Board of Environmental Protection, ___A.2d ___ (1987), slip. op. at 5, 7/14/87.

It is by no means certain that either a federal court or the Law Court would construe the U.S. Constitution requirements on an identical basis in the case of a state-mandated closure of Maine Yankee.[21]

The general rule has been that when property is rendered "substantially useless" due to state action, a compensable taking has occurred. Sibley v. Inhabitants of the Town of Wells, 462 A.2d 29, 31 (Me 1983); LURC v. White, 521 A.2d 710 (Me 1987). Examples of compensable takings in U.S. Supreme Court precedent follow this general rule, not requiring elimination of all property values in the case of aircraft overflights, artillery shells over claimants'

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[21] Such an analysis would presumably consider whether the Wiscasset site could continue to provide value for its owners by generating electricity by non-nuclear means.

property, or repeated floodings caused by a water project. See Penn Central at 2661. Based on these and other cases, it is clear that the question of whether the forced closure of Maine Yankee constitutes a compensable taking will hinge on interpretations of fact: will the Maine Yankee owners retain significant beneficial uses of their property after closure, will the public utility status of the owners ensure mitigation of any loss or will the value of the property realistically be reduced to zero? In determining how these questions of fact are answered, the court will be guided by fundamental principles of fairness.[22] It remains uncertain if these principles compel payment to Maine Yankee's owners of any compensation whatever, particularly given the public utility status of the owners.

3) Measure of Value for a Compensable Taking

In the event that some compensation will be due, on the basis that a taking has occurred, the remaining questions concern the proper measurement of the Maine Yankee owners' loss. There are three standards of value which could be applied if the courts find that compensation is required. In descending monetary value, these three are: (a) the costs of constructing a "substitute facility" elsewhere, (b) the fair market value of the nuclear power plant and

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22 "The purpose of forbidding uncompensated takings of private property for public use is "to bar government from forcing some people alone to bear public burdens which, in all fairness and justice, should be borne by the public as a whole". Penn Central at 1027 citing Armstrong v. US, 364 US 40, 49 (1960).

(3) the book value of the power plant, less depreciation, as recorded for ratemaking by the Public Utilities Commission and by the Federal Energy Regulatory Administration.

a) Substitute Facility

The use of a "substitute facility" measurement of just compensation can be expected to cost a total of $3-5 billion in construction costs and interest expense, based on completion costs for recent nuclear power plants of Maine Yankee's size or greater. In a 1979 case, the United States Supreme Court rejected the "substitute facilities" measure of compensation for condemned property owned by a non-profit summer camp organization. US v. 564.54 Acres of Land, 441 US 506 (US, 1979). Noting that "substitute facilities" compensation has been ordered primarily in the case of public condemnees, such as roads or sewers taken by the state for another purpose, the Court stated:

> In condemnations of property owned by public entities, lower courts have applied the reasonable-necessity standard to determine if the entity has an obligation to continue providing the facilities taken...If the condemnee has such a duty to replace the property, these courts have reasoned that only an award of the costs of developing requisite substitute facilities will compensate for the loss. US v. 564.54 Acres of Land at 515.

In the case of Maine Yankee, its owners are obligated under varying state utility laws to provide electricity to the public, but are not specifically required to generate that electricity at a

nuclear facility. Consequently, it would not appear that the "substitute facilities" standard would be required in the case of compensation due Maine Yankee's owners.

b) Fair Market Value

While generally the courts have held that fair market value is the normal basis for just compensation,[23] its use is not compelled in cases which would result in "manifest injustice to owner or public" or where fair market value is difficult to ascertain.[24] Because public utility facilities rarely trade hands, it certainly is the case that the value of Maine Yankee as a capital asset sold on an open market will be exceedingly difficult to establish. The value of capacity and energy generated at Maine Yankee during the remaining years of its NRC license is more susceptible to fair market value estimation within the existing NEPOOL market for power; in fact, the cost of replacement power is selected in both 1986 and 1987 State Planning Office studies as the most objective standard for measuring any compensation which might be owed to Maine Yankee's owners. Notwithstanding the difficulty of making precise estimates of the value of the facility itself, there can be little doubt that the Maine Yankee owners will point to fair market value compensation

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23 Olson v. US, 292 US 246, 255 (1934), Knox Lime Co. v. Maine State Highway Commission, 230 A.2d 814 (Me 1967).

24 US v. Commodities Trading Corp., 339 US 121, 123 (1950); US v. 50 Acres of Land, 469 US 24, 30 (1984).

as the measure which has been regularly upheld in the case of public takings of private property. US v. 564.54 Acres of Land at 516.

c) Net Book Value

The remaining question then becomes: can Maine Yankee's value properly be measured by the net book value of the facility, after adjustments for depreciation over 15 years, and as recorded in regulatory accounting practice? This question ultimately can only be determined by a court and is subject to conflicting claims. On the one hand, the courts have repeatedly discounted claims of loss for future profits as not compensable under the Fifth Amendment;[25] hence, the Maine Yankee owners' claim for compensation on a future return on the net book value of their asset[26] is subject to challenge. On the other hand, numerous courts have distinguished as inconsistent the underlying purposes of ratemaking valuation of utility property and of Fifth Amendment compensation.[27]

To the extent that any compensation paid to the owners will be treated as a credit in setting retail rates for Maine Yankee's

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[25] "The opportunity to use property for future profit is not such a fundamental attribute of ownership [as to require compensation]" Seven Island Land Co. v. Maine LURC, 450 A.2d 475, note 10 (Me. 1982), quoting Andrus v. Allard, 444 US 51, 60 (1980).

[26] Maine Yankee's net book value as of June 30, 1987, including recent construction work, was $209,339,893, plus nuclear fuel.

[27] Onondaga County Water Authority v. NY Water Service Corp., 139 NY.2d 755, 763 (1955).

owners, it is probable that any taxpayer payment to Central Maine Power, Maine Public Service and Bangor Hydro ultimately will be used to reduce their respective costs of service to Maine ratepayers. If the Public Utilities Commission were to adopt this ratemaking treatment, the actual impact of the 1987 Referendum on Maine ratepayers would become the increased costs of replacement power alone.[28] However, it is by no means as clear that utilities commissions in the other New England states are authorized, or compelled, to make the same offsetting adjustment in retail rates for Maine Yankee's seven out-of-state owners. Hence, Maine taxpayers will necessarily have to bear the full requirement of compensating these out-of-state owners. In effect, this would constitute a transfer payment from Maine's General Fund to the rest of New England equal to 50% of the value of Maine Yankee.

4) Length and Costs of Litigation

Based on the previous discussion of federal preemption, Commerce Clause, Contract Clause and taking questions under the

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[28] Additionally, Maine taxpayers who are not ratepayers of the Maine owners would bear the full cost of the increased tax obligation, without any offsetting adjustment in retail rates. This group would include all ratepayers of Maine's publicly owned utilities, including the towns of Madison, Houlton, Kennebunk and the Union River, Fox Island and Eastern Maine Electric Cooperatives. The latter, serving 9000 customers in Penobscot, Washington and Aroostook counties would additionally lose its entitlement to a small amount of Maine Yankee capacity and would consequently bear the costs of replacement power as well.

Fifth Amendment, it is evident that the enactment of the 1987 Referendum could well set in process a complex and time-consuming series of court challenges to the new law. The fact that these questions have not previously been litigated in the context of a forced nuclear plant closure will only add to the time and expense of these challenges. Insofar as any final judicial decision upholding the 1987 Referendum could well stimulate similar efforts in other states, it is likely that the legal resources available to the Maine Yankee owners will be substantial.

Consequently, it is easy to predict that the litigation triggered by enactment of the Referendum will not be concluded until well into the next decade and tht it will be costly. The recoverability from ratepayers of costs of this litigation (at the Federal Energy Regulatory Commission for wholesale ratemaking purposes and at the Maine Public Utilities Commission for retail making purposes) may itself be the subject of future litigation.

The more important issue is whether, assuming no pre-emption, the state would owe compensation from the date of the Referendum's enactment, as opposed to the date that a court finally rules that compensation is due - hypothetically in 1992. Until recently, the answer to this question was relatively simple: Maine Yankee's owners would have to wait for compensation until the date of a final court determination and only then after all proper procedures and remedies had been pursued. As of that eventual date, compensation

could well be prospective only and not encompass any claim of taking for the period covered by the appeal itself.[29]

A 1987 United States Supreme Court decision has for the first time concluded that, if Fifth Amendment concerns ultimately compel payment of just compensation, compensation is also owed for the "temporary taking" which occurred while the issue was before the courts. First English Evangelical Lutheran Church of Glendale v. County of Los Angeles, ___US___, slip. op. 6/9/87. In cases where a condemnee has been denied all use of its property during the appeal period prior to a successful appeal, failure to provide "payment of fair value for the use of the property during this period of time would be a constitutionally insufficient remedy." First Lutheran, slip. op. at 16. Based on this recent decision, it appears probable that replacement power costs, or some other measure of fair value, would be awarded Maine Yankee's owners for the appeal period, if they eventually prevail in a claim for just compensation.

It should be noted, however, that given the likelihood of federal preemption of the 1987 Referendum, Maine Yankee's owners could well prevail in any request for a Temporary Restraining Order permitting the continued operation of the power plant during the period of litigation. In such a case, compensation for a temporary

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[29] See MacDonald, Sommer and Frates v. Yolo ounty, 477 US___, slip. op. (1986); Williamson County Regional Planning Comm. v. Hamilton Bank, 473 US 172, n. 11 (1985); but see US v. Sioux Nation of Indians, 100 S. Ct. 2716 (1980) where the Court orders interest from 1877 as proper measure of retroactive compensation.

taking need not be awarded since the power plant will not cease operation as a result of state action. If the owners simply comply with state law and seek no injunction permitting the continued operation of the plant, the First Lutheran decision arguably could compel state payment for all costs during the appeal period. Such a decision by the owners, of course, would have major detrimental effects on electric rates throughout New England.

Unless a court ultimately upholds the constitutionality of the Referendum in a final judgment, and finds that a compensable taking has occurred, no compensation would be owed Maine Yankee's owners. Without specific findings that no Supremacy, Contract or Commerce Clause violation has occurred, the 1987 Referendum will be overturned and have no force and effect.

Appendix 2

Maine Public Utilities Commission Staff Estimates of Annual Costs to Replace Maine Yankee Power, 1989-2008

MAINE PUBLIC UTILITIES COMMISSION STAFF ESTIMATES OF ANNUAL COSTS TO REPLACE MAINE YANKEE POWER, 1989-2008, FOR EACH MAJOR UTILITY, WITHOUT COMPENSATION OF OTHER OWNERS, UNDER TYPICAL CURRENT PLANNING ASSUMPTIONS. ALL COSTS ARE EXPRESSED IN CONSTANT (1986) DOLLARS.

CHANGE IN COSTS (Millions)

	CMP	BHE	MPS	TOTAL
1989	$46.00	$9.50	$5.10	$60.60
1990	$44.00	$9.50	$5.00	$58.50
1991	$36.20	$10.60	$5.30	$52.10
1992	$41.10	$11.70	$5.60	$58.40
1993	$42.30	$12.00	$7.40	$61.70
1994	$68.70	$12.30	$7.90	$88.90
1995	$63.30	$13.60	$7.50	$84.40
1996	$66.90	$11.10	$8.00	$86.00
1997	$59.00	$11.40	$7.20	$77.60
1998	$54.80	$11.70	$8.00	$74.50
1999	$44.20	$12.10	$8.30	$64.60
2000	$39.50	$12.40	$7.80	$59.70
2001	$56.30	$12.70	$9.10	$78.10
2002	$51.50	$13.00	$9.50	$74.00
2003	$69.30	$13.30	$9.20	$91.80
2004	$57.00	$13.60	$9.60	$80.20
2005	$71.30	$13.90	$1.23	$86.43
2006	$73.60	$14.20	$13.20	$101.00
2007	$72.50	$14.50	$13.60	$100.60
2008	$64.90	$14.70	$8.10	$87.70
2009	($96.40)	($7.90)	($16.20)	($120.50)
2010	($78.00)	($9.00)	($13.10)	($100.10)
2011	($37.80)	($12.20)	($6.30)	($56.30)
2012	($31.20)	($13.50)	($5.20)	($49.90)
2013	($38.60)	($17.40)	($6.50)	($62.50)
2014	($55.90)	($18.80)	($9.40)	($84.10)
2015	($52.90)	($20.00)	($8.90)	($81.80)

CHANGE IN AVERAGE RATE

	CMP	BHE	MPS
1989	6.2%	6.9%	8.9%
1990	5.7%	7.0%	8.5%
1991	4.5%	7.6%	8.9%
1992	4.5%	8.0%	9.3%
1993	4.9%	7.9%	11.7%
1994	7.9%	8.4%	12.7%
1995	7.2%	8.7%	11.9%
1996	7.6%	7.1%	12.6%
1997	6.5%	7.2%	11.3%
1998	6.1%	7.3%	12.7%
1999	4.8%	7.4%	13.0%
2000	4.2%	7.4%	12.1%
2001	5.9%	7.4%	14.1%
2002	5.3%	7.5%	14.7%
2003	7.0%	7.6%	14.1%
2004	5.7%	7.6%	14.6%
2005	6.8%	7.7%	18.7%
2006	6.9%	7.7%	19.8%
2007	6.6%	7.8%	20.1%
2008	5.8%	7.8%	11.9%
2009	-7.7%	-3.7%	-21.3%
2010	-6.1%	-4.2%	-17.0%
2011	-2.9%	-5.7%	-8.2%
2012	-2.3%	-6.2%	-6.8%
2013	-2.9%	-7.9%	-8.3%
2014	-3.9%	-8.0%	-11.2%
2015	-3.7%	-8.5%	-10.7%

Appendix 3

Memorandum from Joseph Sukaskas to Richard Parker, Maine Public Utilities Commission Regarding Nuclear Safety and Decommissioning Issues

STATE OF MAINE

Inter-Departmental Memorandum

Date August 6, 1987

To Richard Parker, Senior Utility Planner — Dept. PUC - Technical Analysis

From Joe Sukaskas, Technical Analyst — Dept. PUC - Technical Analysis

Subject Maine Yankee Shutdown Study

Your July 21 memo assigned me the responsibility to "review and update decommissioning cost estimates, and nuclear safety issues" for the Maine Yankee Shutdown Assessment 1987 Update.

Attached are my draft comments and material compiled to address those issues. My comments are in draft form, and will need to be integrated into an overall outline at a later date.

With respect to safety, comparisons have been made between Maine Yankee and other plants, and a summary of the plant's last three years' safety reports is included.

As spent nuclear fuel is a topic which is integral to both safety and also other shutdown-related issues as well, an update is provided on both economic and physical aspects of this topic.

A summary of potential Maine Yankee accident costs has been included, followed by an update of the implications of Chernobyl. That section includes both technical and systematic parallels, and touches briefly on complications of preemption.

Finally, an update of Maine Yankee decommissioning factors is presented, along with a listing of decommissioning resources for further reference.

Some of the information enclosed can be directly inserted into the study report body, if found acceptable by the coordinating staff. Parts of the attached information may be more appropriate for inclusion in a technical appendix, however.

All referenced materials are available in the MPUC IRC.

Please advise what additional information you would like, or what restatement or redrafting of these materials could be useful in completing the assessment report.

cc: Richard Darling

MAINE YANKEE SHUTDOWN ASSESSMENT

JDS COMMENTS/MATERIAL

- Generation Productivity
- Unplanned Reactor Scrams
- NRC Evaluations
- Safety Reporting

- Spent Nuclear Fuel
- Spent Fuel Storage

- Financial Consequences of a Catastrophic Accident
- Chernobyl
  - System Design
  - Operator and Procedural Error
  - An Industry View
  - Implications of the Chernobyl Accident
  - Federal Preemption

- Decommissioning
  - MPUC Resources - Maine Yankee Decommissioning

NRC EVALUATIONS. A measure of the compliance of nuclear generating stations with U.S. Nuclear Regulatory Commission (NRC) performance criteria is the NRC Systematic Assessment of Licensee Performance (SALP) program.

The SALP program is an integrated NRC staff effort to consolidate available observations and data and to evaluate licensee performance based on this information. It assesses licensee performance in selected functional areas. For facilities in operation these areas generally include: plant operations (OPS), radiological controls (RADCON), maintenance (MAINT), surveillance (SURV), emergency preparedness (EP), fire protection (FP), security (SEC), outages (OUTG), quality programs and administrative controls affecting quality (QP), licensing activities (LIC), and training and qualification effectiveness (TRG).

Based on a review of the consolidated information, each functional area evaluated is placed into one of three performance categories. A Category 1 rating designates a high level of performance, a Category 2 rating designates a satisfactory level of performance, and a Category 3 rating designates a minimally acceptable level of performance where weaknesses are evident, and both NRC and licensee attention should be increased.
DRAFT/8-87

SALP ratings for Maine Yankee, and the average of SALP ratings for twenty-seven reactors operating in NRC's Region I (northeast), taken from NRC's spring, 1987 summary of these ratings,* and NRC's subsequent Maine Yankee SALP, are shown below.

	MAINE YANKEE 9/84	MAINE YANKEE 1/86	MAINE YANKEE 4/87	NRC REG 1 3/87
OPS	3	2	1	1.8
RADCON	2	2	2	1.8
MAINT	2	2	2	1.8
SURV	2	1	1	1.6
FP	2	1	N	1.3
EP	1	1	1	1.5
SEC	1	1	1	1.5
OUTG	1	2	N	1.6
QP	N	N	2	1.9
LIC	2	2	2	1.6
TRG	N	N	1	1.9

N: Not rated in assessment period

*"Historical Data Summary of the Systematic Assessment of Licensee Performance," NUREG-1214 Revision 1, Office of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, April 1987.
DRAFT/8-87

GENERATION PRODUCTIVITY. A measure of the productivity of a power generating plant is the unit's Capacity Factor (CF), which is the ratio of total gross power generated, in MwH, to the product of the plant's gross generating capacity and the number of hours in the period under study.

A comparison of the Capacity Factors for Maine Yankee, for eight New England nuclear generating plants, and for all nuclear generating plants operating in the U.S., derived from data published in Nucleonics Week, is shown below.

PERIOD	U.S.	NEW ENGLAND	MAINE YANKEE
1984	59.5%	63.7%	70.1%
1985	55.2%	73.0%	73.6%
1986	56.7%	62.5%	85.4%
1987* (Jan-Mar)	61.5%	75.4%	84.6%

*Through the end of Maine Yankee's last operating cycle.

UNPLANNED REACTOR SCRAMS. A measure of the reliability of reactor plant systems is the number of unplanned reactor scrams, or shutdowns, encountered per year. A comparison of the number of unplanned scrams at Maine Yankee, with the average number of such shutdowns at groups of similar plants, is shown below.

PERIOD	MAINE YANKEE	C-E PWRs*	ALLALL PWRs* LWRs*
1984	5	5.9	6.35.9
1985	6	7.5	6.76.0
1986	4	6.2	5.35.1

This data was derived from reports of NRC evaluations appearing in Nuclear News, and from Maine Yankee data.

*KEY

PWR: Pressurized Water Reactor
C-E: Combustion Engineering (supplier of the Maine Yankee Nuclear Steam Supply System)
LWR: Light Water Reactor (includes both Boiling Water Reactors and PWRs)

SAFETY REPORTING. Maine Yankee is required by statute (35-A M.R.S.A. 4334) to report safety-related incidents at the plant. According to the company's reports, "not all of the subjects covered ... are safety related," but include reports "about non-safety aspects of safety-related equipment and systems ... in order to provide a broad view of the operation of Maine Yankee."

Maine Yankee listed 18 "Reportable Occurrences" in 1984, 19 in 1985, and 8 in 1986. Summaries as reported by Maine Yankee appear on the following pages.

SPENT NUCLEAR FUEL. The Nuclear Waste Fund was established to finance activities under the Nuclear Waste Policy Act of 1982 (the Act), Public Law 97-425.

The Act's key financial concept is that the cost to the Federal Government of providing disposal and/or storage services shall be fully recovered from the generators and owners of spent nuclear fuel and high level radioactive waste.

The Nuclear Waste Fund is the financing mechanism for DOE's Office of Civilian Radioactive Waste Management (OCRWM), the office charged with managing the nation's nuclear waste program in accordance with the mandates of the Act.

Under the Act, nuclear utilities, through contracts with DOE, pay a one mill (one-tenth of a cent) per kilowatt hour disposal fee for commercial spent nuclear fuel generated beginning April 7, 1983. Maine Yankee pays these fees on a quarterly basis.

For commercial spent fuel or high-level waste generated prior to April 7, 1983, three payment options were made available to utilities: 1) pay in 40 quarterly installments with accrued interest; 2) pay in a lump sum with accrued interest prior to the first scheduled delivery of spent fuel to DOE for disposal; or 3) pay in a lump sum prior to June 30, 1985, with no interest.

Most owners and generators of commercial spent fuel and high-level waste, primarily utilities, chose to pay the one-time fee by June 30, 1985.*

Maine Yankee, however, elected to make a single payment under the second option outlined above, and in 1983 entered into a contract with DOE covering on-going fuel disposal cost, as well as the accrued prior obligation of $50,367,000.

Interest on the obligation accrues at the 13-week Treasury Bill rate compounded on a quarterly basis from April 7, 1983, through the date of the actual payment. Interest accrued through December 31, 1986, amounted to $17,964,000. The Company has formed a trust to provide for payment of this long-term fuel obligation. Funding of the trust is being made by deposits of approximately $4,100,000 at least semiannually beginning December, 1985, and continuing through May, 1997, totaling

approximately $98,800,000. The trust fund deposits plus estimated earnings are projected to meet the total estimated liability of $169,600,000.**

(*"OCRWM Backgrounder: The Status of the Nuclear Waste Fund," DOE/RW-0034, Office of Policy and Outreach, Office of Civilian Radioactive Waste Management

**Part I, Item 1-Business, Federal Energy Regulatory Commission Report, Form 1, Maine Yankee Atomic Power Company, Form 10-K - 1986.)

Maine Yankee has named Norstar Bank of Maine as its trustee, and has reported that as of December 31, 1986 the carrying value of the fund was $17,091,310.71 and the fund had a market value of $17,664,053.24. According to the Company's report, the Funds have continued to be invested in tax exempt securities with no maturity later than January 1, 1988, and the weighted average yield to maturity of the fund as of December 31, 1986, was 7.28%*

The Act requires an annual evaluation of the adequacy of the one-mil per kilowatt hour fee to ensure full cost recovery and provide for adjustment of that fee, as needed, with the approval of Congress. A proposal to Congress for a fee adjustment is required only if DOE determines that an adjustment to the on-going fee is required. To date, such an adjustment has not been necessary. OCRWM's last evaluation** found the 1.0 mill per net kilowatt-hour fee adequate.

Further, the DOE Inspector General reviewed the procedures and practices used to compute and collect the fees due to the Nuclear Waste Fund, to include both on-going and one-time fees. The IG found "adequate controls exist to determine and collect on-going fees." However, some concerns were expressed about the complete availability of funds when payment is due, particularly in cases where utilities faced future financial uncertainties.***

*Maine Yankee Report to the Governor on the Status of the Spent Nuclear Fuel Disposal Trust Fund, February 9, 1987.

**"Nuclear Waste Fund Fee Adequacy: An Assessment," DOE/RW-0020 Rev., Office of Civilian Radioactive Waste Management, June, 1987.

***"Accuracy of Fees Paid by the Civilian Power Industry to the Nuclear Waste Fund," DOE/IG-0231, Office of Inspector General, U.S. Department of Energy, October 27, 1986.

SPENT FUEL STORAGE. Until the Department of Energy (DOE) accepts spent nuclear fuel* for disposal at a Nuclear Waste Policy Act (NWPA) facility, nuclear utilities have the primary responsibility for the storage of their spent fuel and for the effective use of that storage capacity. Spent fuel assemblies removed from nuclear reactors are stored temporarily in water pools that cool the spent fuel rods and shield workers and others at the site against radiation. Many of these storage pools were intended originally for short-term storage, and their capacities are generally limited.

A Maine statute (35-A M.R.S.A. 4371) provides that after July 1, 1992, spent nuclear fuel may not be stored on-site for a period exceeding three years from the date of removal of the fuel from the reactor. The Company has estimated that shipments of spent nuclear fuel to the DOE will not commence before 1998.** Recent government-industry estimates for repository startup schedules which would trigger such shipments project 2003 as a more likely operational date.

We cannot predict whether, or to what extent, the Maine statute and storage capacity limitations referred to above may be modified and whether, or to what extent, they will affect the operation of Maine Yankee. The statute does not explicitly govern the operation of Maine Yankee. The question is whether Maine Yankee could continue to operate the generating plant if its spent fuel facilities were in violation of the statute. The answer to this question depends on the interpretation and application of the statute and the constitutionally thereof.

(*Spent nuclear fuel refers to fuel that has been removed from a nuclear reactor core primarily because it can no longer sustain an efficient chain reaction. High-level radioactive waste, generated from the reprocessing of spent nuclear fuel to extract plutonium and the remaining usable uranium, results largely from defense nuclear activities.

**Federal Energy Regulatory Commission Report, Form 1, Maine Yankee Atomic Power Company, Form 10-K, 1986.)

Under the terms of a license amendment approved by the Nuclear Regulatory Commission (NRC) in 1984, the present storage capacity of the spent fuel pool at Maine Yankee will be reached in 1996, and after 1992 the available capacity of the pool would not accommodate a full core removal.

Some nuclear utilities, faced with potential spent fuel storage problems, have developed and subsequently obtained approval from the NRC for various methods of extending their on-site storage capacity.*

One method employed by the utilities is the "reracking" of fuel assemblies in storage pools to obtain greater storage

REF: Maine Yankee Event Report 86-006

On October 19, 1986, a steel beam above one of the main station output transformers became overheated due to the failure of the normal ground path for the generator isophase bus duct. The reactor and turbine generator were manually tripped from 92% power to prevent further equipment degradation. Investigation revealed that the ground shunts for the normal path had been improperly installed. Corrective actions included repairing and reinstalling the ground shunts, inspecting the beam and ductwork for damage and inspecting other similar shunts. All ground connections were reinspected after return to full power and no hot spots detected.

Human health and the environment were not affected by this event.

Corrective action costs were less than two thousand dollars.

REF: Maine Yankee Licensee Event Report 86-007

On November 15, 1986, the reactor automatically tripped from 100% power when loss of the turbine-driven main feedwater pump tripped the main turbine. A loose electrical connection on the feedwater pump's main oil pump caused the oil pump to stop. The standby oil pump did not recover control oil pressure soon enough and the feedwater pump tripped. The loose connection was repaired and modifications were made to the oil system to ensure the standby oil pump will recover system pressure prior to reaching the trip setpoint.

There were no effects on human health or the environment.

The corrective action costs were less than one thousand dollars.

REF: Maine Yankee Licensee Event Report 86-008

On December 2, 1986, a power reduction from 97% power was commenced when both subsystems of the standby control room breathing air were declared inoperable due to insufficient flow rate. Immediate corrective action involved removing the internals of the inline check valve in one subsystem, increasing the flow rate in that subsystem above the required minimum. The power reduction was stopped at 35% power when the standby breathing air system was declared operable. Additional corrective action involved installation of new check valves in each subsystem. Each subsystem now provides sufficient air flow to exceed minimum requirements.

There were no effects on human health or the environment.

The corrective action costs were less than two thousand dollars.

densities. By changing the configuration of the racks that hold the spent fuel in the storage pools, and by adding neutron-absorbing material, it is possible to store more than double the fuel than had been held in the originally designed racks.

Another method is "rod consolidation," which differs from reracking in that rod consolidation involves dismantling the fuel assemblies in reconfigured storage racks that are designed for higher storage densities. Rod consolidation may be done in a storage pool, or it may be done in a dry environment. Rod consolidation increases the capacity of spent fuel storage pools that have sufficient structural strength to safely support a more compact array of spent fuel rods that have been separated from their associated hardware components.

(*"OCRWM Backgrounder: Cooperative Demonstration Projects for Spent Nuclear Fuel," DOE/RW-0099, Office of Policy and Outreach, U.S. Department of Energy, September, 1986.)

In 1981, DOE successfully completed a "cold" (non-radioactive) demonstration of prototypical rod consolidation equipment. In May 1983, DOE issued a solicitation for cooperative agreement proposals for in-pool rod consolidation demonstrations that could provide a basis for future licensing by the NRC. A cooperative agreement for a rod consolidation demonstration project has been negotiated with the Northeast Utilities Services Company of Hartford, Connecticut.

In Maine Yankee's case, the Atomic Safety and Licensing Board has approved the company's proposal to test a consolidation methodology which would, if implemented, permit storage capacity through the operating life of the plant. That implementation would require further approval from the NRC.

A third alternative could be a dry storage method. Dry storage systems provide a fuel storage alternative when reracking or rod consolidation cannot be undertaken because of economic, seismic, or structural limitations of spent fuel storage pool systems. Systems for dry storage include casks, drywells, silos, and vaults. Casks are large metal containers with radiation shielding that are stored above ground. Drywells are below-grade wells with steel and concrete lining that are designed to hold one or more spent fuel assemblies; the surrounding earth provides an additional radiation barrier, as well as a medium for conducting heat from the dry well. Silos are concrete cylinders built above ground that provide sealed secondary containment for spent fuel. Vaults are large concrete structures that use natural air convection for cooling. All of these dry storage systems are designed to have low maintenance requirements and to be modular in order to provide additional capacity as required. However, dry storage systems demonstrated under the DOE's auspices have never been licensed by the NRC for commercial use. Dry storage casks with a capacity of twelve fuel assemblies have

been estimated to cost up to $2 million each, and, thus, the economic viability of this alternative has yet to be proven.

Maine Yankee received approval for a limited pilot rod consolidation project, and has authorization to consolidate twenty fuel assemblies on a demonstration basis. One 8-in. by 8-in. fuel assembly has been processed under that authorization, and the company has indicated that it plans to complete the demonstration project prior to 1990.

The company's estimate of spent fuel pool capacity is that it will accomodate the plant's spent nuclear fuel storage needs until 1999. That estimate does not assume that storage space is available for the fuel in the plant's reactor core, however; to maintain the capability for unloading the entire core, know as "full core rejection" (FCR) capability, a pool exhaust date of 1995 can be assumed.

Maine Yankee's planned rod consolidation methodology would increase the pool's storage capacity by 60%, and, thus, would enable the plant to extend the spent fuel pool exhaust date past the plant's operating license expiration in 2008.

FINANCIAL CONSEQUENCES OF A CATASTROPHIC ACCIDENT. The April, 1986 Chernobyl accident in the Soviet Union showed that a major nuclear power plant accident could cause significant personal injury and property damage. At that time, the potential financial consequences of such an accident in this country had not been assessed. At the request of Senator George Mitchell, the U.S. General Accounting Office (GAO) estimated what these consequences might be and examined the need for financial protection against a nuclear accident in this country. The GAO report* was addressed to various Congressional committees because of the broad implications of these issues, to assist those committees in reassessing liability protection provided by the Price-Anderson Act.

Inflation has decreased the level of financial protection originally established by that act; the $560 million limit for commercial activities would be $2.2 billion in today's dollars. Further, on the basis of GAO's assessment, the off-site financial consequences of a catastrophic accident for 119 commercial plants could range from $67 million to $15.5 billion; the consequences for Maine Yankee were estimated by GAO to be:

Estimated Property Costs:	$291 Million
Personal Injury Costs:	64 Million
Total Consequences:	$355 Million

*"Nuclear Regulation: A Perspective on Liability Protection for a Nuclear Plant Accident," GAO/RCED-87-124, U.S. General Accounting Office, June, 1987.

The Price-Anderson Act may not cover the costs of a precautionary evacuation at an NRC licensee, however. The act defines a nuclear incident as an occurrence that causes damage as a result of the radioactive properties of nuclear materials. Confusion exists over whether the public could seek compensation where the release of radioactive material appears imminent, such that a precautionary evacuation is ordered, but no release occurs. NRC's licensees thus carry insurance to cover precautionary evacuation costs.

CHERNOBYL. In the past year, exhaustive studies of the April, 1986, accident at the Soviet Union's Chernobyl-4 nuclear power station have been conducted, with the international scientific community seeking to identify any lessons which could be learned from that accident for improving nuclear plant safety. Conclusions which have been drawn are similar, but recommendations based on those conclusions vary widely.

As the Soviet report prepared for the International Atomic Energy Agency stated:

> "The accident at Chernobyl' was the result of coincidences of several events of low probability."*

Most published assessments concur with that statement, and go on to attribute specific causes of the accident to system design, and also to operator and procedural error.

*"The Accident at the Chernobyl' AES and its Consequences," U.S.S.R. State Committee for the Utilization of Atomic Energy, August, 1986.

SYSTEM DESIGN. The accident at Chernobyl-4 involved a Soviet-designed high-power, graphite-moderated boiling-water-cooled reactor, identified as an RBMK-1000 system. According to compendium of U.S. assessments,* this uniquely Soviet design evolved from early demonstration and plutonium production reactors. General characteristics of the RBMK and its predecessors include the use of graphite as a neutron moderator and light water as the coolant. Pressure tubes, contained in vertical channels in the graphite, either contain low-enriched uranium oxide fuel or are used as locations for control rods and instrumentation.

The use of boiling water as a coolant in a pressure-tube, graphite-moderated reactor distinguishes the RBMK design from any other reactor design. Other distinguishing features of the RBMK design include:

- on-line refueling
- single uranium enrichment level
- separation of core cooling into independent halves
- use of computerized control systems
- separate flow control for each pressure tube
- positive void reactivity coefficients under most operating conditions
- slow scram system
- steam suppression system
- programmed power setbacks (rather than scrams) for various abnormal conditions
- low coolant-to-fuel ratio

- accident localization system

*"Report on the Accident at the Chernobyl Nuclear Power Station," NUREG-1250, Department of Energy/Electric Power Reseach Institute/Environmental Protection Agency/Federal Emergency Management Agency/Institute of Nuclear Power Operations/Nuclear Regulatory Commission, January, 1987.

Chernobyl Unit 4 was one of 14 operating RBMK-1000 reactor plants. Significant differences exist in RBMK-1000 designs, as they have evolved from the early Leningrad design (first-generation RBMK, eight total units) to the more modern Smolensk design (second-generation RBMK, six total units, including Chernobyl Units 3 and 4). This evolution of the RBMK design is often difficult to discern in Soviet literature, and details of the plant-specific differences among the 14 plants are not available. However, descriptive material of second-generation RBMK-1000 reactors is more complete, especially as a result of information in the Soviet report on the accident.

OPERATOR AND PROCEDURAL ERROR. Chronologies of the Chernobyl-4 accident reveal a number of operator and procedural errors which contributed to the accident, which occurred during the performance of a turbine generator test. The test procedures had not been adequately reviewed from a safety standpoint. Management control of the performance of the test was not maintained; the test procedure was not followed; safety systems were by-passed; and control rods were operated incorrectly. Operators lost control of the reactor during the performance of the test.

Information available indicates that Chernobyl Unit 4 was one of the best of the 14 operating RBMK-1000 units. The training and experience of the operating crew may have focused mainly on steady-state operation since the reactor operated continually as a base-loaded unit with on-line refueling. Evidently, very little, if any, training had been conducted on a plant simulator. Only one simulator at another site has been mentioned as possibly serving the training needs of operators of all RBMK units.

The U.S. review concluded that the previous excellent performance created an attitude in plant personnel that close adherence to procedures was unnecessary; in effect, the previous trouble-free operation led to a dominating overconfidence.

The RBMK units had accumulated more than 100 reactor-years of operation. Chernobyl Unit 4 had been in operation two years. It is not known what events had occurred at RBMK units that may have been precursors to the April, 1986, accident or what corrective actions had been taken in the areas of design, operations, or training.

AN INDUSTRY VIEW. The Atomic Industrial Forum, which refers to itself as "the association of the nuclear industry," stated in an annual overview of the state of that industry:*

> Chernobyl was the ultimate civilian nuclear disaster: It resulted in total destruction of a power reactor, widespread distribution of radioactive materials over a broad area of the globe, prompt fatalities (31), and the possibility of future health effects. The accident raised questions in the minds of public officials, and triggered a review of emergency procedures as well as a new look at some U.S. containment systems. In many countries, including the United States, Chernobyl was cited by some as a reason to close or delay startup of nuclear power plants.

AIF concluded, however, that "both the design characteristics of the Chernobyl-type reactor and the procedures followed by its operators combined to create a situation that would not be duplicated anywhere else in the world." The AIF statement continued by quoting the Association's President, Carl Walske.

According to Walske, "Chernobyl enters the history books as the accident that proved the basic correctness of nuclear power design and operating decisions made in the West more than two decades ago. The major lessons of Chernobyl are to be learned by the Soviets."

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*"The Nuclear Industry in 1986: A Year of Incongruities," Info News Release, Atomic Industrial Forum, Inc., December 12, 1986.

IMPLICATIONS OF THE CHERNOBYL ACCIDENT. Conclusions being drawn about causes of the accident at Chernobyl-4 in April, 1986, point to management and administrative control breakdown, operator errors, procedural and training deficiencies, equipment and system design inadequacies, and equipment failures.

Compounding factors were inattentiveness, low levels of diligence, and overconfidence by responsible personnel, who tended to trust previous experience rather than carefully-developed procedure.

Additionally, the simultaneous occurrence of a number of these factors was unanticipated or unforeseen in the development of planning scenarios on which Chernobyl-4 operations were based.

Apart from any arguable technological similarities between Chernobyl-4 and U.S. nuclear plants, the conceptual problems stated above unquestionably have some parallel outside the Chernobyl-4 experience.

For example, the following inadequacies were identified in an investigation* of the Three Mile Island 2 accident in March, 1979:

1. Equipment performance (failures and maloperation).
2. Transient and accident analyses.
3. Operator training and performance.
4. Equipment and system design.
5. Information flow, particularly during the early hours of the accident.
6. Implementation of emergency planning.

*"Investigation into the March 29, 1979, Three Mile Island Accident by Office of Inspection and Enforcement," Investigative Report No. 50-320/79-10, NUREG-0600, U.S. Nuclear Regulatory Commission, August, 1979.

The investigative report continued:

> Perhaps the most disturbing result of the IE investigation is confirmation of earlier conclusions that the Three Mile Island Unit 2 accident could have been prevented, in spite of the inadequacies listed. The design of the plant, the equipment that was installed, the various accident and transient analyses, and the emergency procedures were adequate to have prevented the serious consequences of the accident, if they had been permitted to function or be carried out as planned. For example, had the operators allowed the emergency core cooling system to perform its intended function, damage to the core would most likely have been prevented. There are other examples set forth in the report where, had a particular operator action been taken, the consequences of the accident could have been significantly mitigated. On the other hand, had

certain equipment been designed differently, it too, could have prevented or reduced the consequences of the accident. The results of the investigation make it difficult to fault only the actions of the operating staff. There is considerable evidence of a "mind set," not only by TMI operators but by operators at other plants as well, that overfilling the reactor coolant system (making the system solid) was to be avoided at almost any cost. Undue attention by the TMI operators to avoiding a solid system led them to ignore other procedural instructions and indications that the core was not being properly cooled. Without this "mind set" they might well have acted to preclude or better mitigate the accident.

The accidents at Chernobyl-4 and Three Mile Island 2 cannot be dismissed as totally unrelated. A pattern of system failure recurs in these accidents; the pattern extends to non-nuclear facilities, as well. To cite a memorable example, on July 13, 1977, the entire electric load of the Con Edison system was lost. New York City and Westchester County were plunged into darkness. Electric service to more than 8 million people in the metropolitan area and to the commercial and industrial users of this area was interrupted for periods from 5 to 25 hours. Although there was no direct loss of life, the economic losses were very large, in part because of extensive looting and malicious property damage.

The collapse of the Con Edison System resulted from a combination of natural events, equipment malfunctions, questionable system design features, and operating errors. Of paramount importance, however, was the lack of preparation for major emergencies such that operating personnel failed to use the facilities at hand to prevent a system-wide failure. Even after the loss of major transmission facilities, a complete system shutdown could and should have been prevented by a timely increase in Con Edison's in-city generation or by manual load shedding.*

The FERC report went on to identify failures in management responsibility; selection, training, and supervision of system operators; system planning, design and operations; equipment inspection and testing, and general preparations for a major emergency.

Clearly evident in reports of all three of these incidents (Chernobyl-4 in April, 1986; Three Mile Island 2 in March, 1979; and Con Edison of New York in July, 1977) is the recurrence of the same generic failures, accompanied by recommendations and cautions that these failures be addressed in future operations throughout the power industries. The reappearance of these same factors in later, and progressively more serious, situations seems to indicate that the required lessons may have not been learned.

*"The Con Edison Power Failure of July 13, and 14, 1977," Final Staff Report, Federal Energy Regulatory Commission, June, 1978.

FEDERAL PREEMPTION. One complication of the extension of experience, or "lessons learned," to improve safety or efficiency at nuclear power stations is federal preemption, which in some critical areas removes state officials from direct jurisdiction over, or perhaps even knowledge of, safety matters. A member of the Nuclear Regulatory Commission during the Three Mile Island 2 incident has described this dilemma:

> "The consequences of the preemption of the states from nuclear safety decision-making came home to roost in the aftermath of Three Mile Island. ... At the point at which the federal regulators and the utility were confounded by puzzling and dangerous events, °Pennsylvania's§ Governor Thornburgh was called upon to make the first nuclear power plant safety decision ever entrusted to a state official - whether or not to evacuate the surrounding population."*

In this respect it may be noted that the Maine Legislature recently enacted legislation creating a State program for the monitoring of safety at Maine Yankee. P.L. 1987,. c. 519 (AN ACT To Establish a State Nuclear Safety Inspection and Monitoring Program for Commercial Nuclear Power Facilities in the State).

*"Where Ignorant Armies Clash by Night -- Relationships Among Nuclear Regulators and Regulated," Address by Peter A. Bradford, Chairman, Maine Public Utilities Commission, to the Nuclear Plant Safety and Reliability Seminar, Valley Forge, Pennsylvania, January 22, 1987.

DECOMMISSIONING. In 1982, the Nuclear Decommission Financing Act was enacted, in which the Maine Legislature found that "timely proper decommissioning ... is essential to protect public health, safety, and the environment and that the cost of decommissioning will be significant." 35-A M.R.S.A. 4351 (1). The Legislature also found "that assurance is needed that funds will be available for the cost of decommissioning which would occur if a nuclear power plant is prematurely closed." 35-A M.R.S.A. 4351 (6).

The NRC currently recognizes three decommissioning methods - complete dismantling and removal, in-place encapsulation or "entombment" and mothballing - or a combination of these methods. Maine Yankee currently proposes to use the complete dismantling and removal method. Through 1986, the Company had collected $13,303,324 for decommissioning costs in accordance with FERC orders approving settlements issued in 1982 and 1985. The Company began collecting annual decommissioning charges of $1,826,100 beginning December 7, 1981. Subsequently, a FERC order increased the allowed decommissioning charge to an annual level of $4,000,000 (exclusive of any income tax liability), effective January 15, 1985. The $4,000,000 was based on the approach of escalating, rather than level, collections over the operating life of the plant.*

On June 19, 1987, a FERC order approved a Maine Yankee proposal to increase decommissioning charges to an annual level of $4,796,000, due to increases in waste disposal costs at the Chem-Nuclear burial facility in Barnwell, South Carolina; these additional payments to the Decommissioning Trust Fund began on June 1, 1987.

*Federal Energy Regulatory Commission Report, Form 1, Year 1986 - Maine Yankee Atomic Power Company, Form 10-K - 1986.

The Decommissioning Fund balance as of December 31, 1986, was $15,041,736 (including interest earned). The fund is maintained in the Maine National Bank.

The 1982 Maine statute (35-A M.R.S.A. 4353) requires the Company to submit a detailed decommissioning financing plan to the Public Utilities Commission for approval. The Company completed the filing of its decommissioning financing plan on January 18, 1984. In that plan, a study, done in 1983 and adjusted in 1984, estimated decommissioning costs of $115,467,000 (in 1983 dollars).

In March, 1986, Staff Participants in the 1986 Maine Yankee Shutdown Assessment estimated decommissioning costs at $200,000,000 (in 1986 dollars) for dismantling and full decommissioning of the plant. Current industry estimates for a plant such as Maine Yankee would likely be in the range of $190,000,000 to $210,000,000 for the same decommissioning option.

Maine Yankee has stated its intent to update its decommissioning study and reevaluate the adequacy of the annual charge by the end of 1987.

Some uncertainties persist in factors which comprise decommissioning cost analyses, however. NRC has still to release its revised Decommissioning Criteria for Nuclear Facilities, initially proposed in February, 1985.

The State's future situation as of the January 1, 1983 deadline of the LLRWPA (at which time the State assumes direct responsibility for all low-level waste in Maine) is uncertain.

The future readiness of DOE to accept high-level waste shipments as of 1998 is questionable.

As a result of these uncertainties, the timing of any Maine Yankee decommissioning, which of necessity must await sites for low-level and high-level waste, is difficult to project. Indeed, Maine Yankee may become an interim high-level waste and spent fuel repository, as well as a low-level waste site, for an indefinite period, depending on developments in these areas and the effect of 35-A M.R.S.A. 4371 (discussed earlier). Although not a preferred or even desirable method, long term on site waste management has been reviewed by Maine Yankee.*

Industry experience is rapidly evolving and is scheduled for review in an International Decommissioning Symposium in October. This session, sponsored by DOE, the International Atomic Energy Agency, and the Nuclear Energy Agency of the Organization for Economic Cooperation and Development, is a follow-up to a DOE symposium in 1982. The MPUC Staff plans to be represented at the October symposium.

Finally, with respect to the Legislative finding, 35-A M.R.S.A. 4356 (6) provides that "assurance is needed that funds will be available for the cost of decommissioning which would occur if a nuclear power plant is prematurely closed," and 35-A M.R.S.A. 4356 (3) provides that if the Decommissioning Trust Fund is insufficient to decommission the plant, the licensee would be responsible for the deficiency, but if the Company were unable to provide the full amount, the statute provides that owners would be jointly and severally responsible for the balance.

A number of resource documents, representing a wide range of Maine Yankee decommissioning topics, has been compiled and is available at the Public Utilities Commission Information Resource Center; a partial listing of these resources appears on the following pages.

*"In-Site Decommissioning/Low-Level Waste Management Topical Report,": APTR-42, Ebasco Services, Inc. for Maine Yankee Atomic Power Company, January, 1987.

MPUC RESOURCES - MAINE YANKEE DECOMMISSIONING

1. "Final Safety Analysis Report - Maine Yankee Atomic Power Station," Maine Yankee Atomic Power Company, August 1970

2. "Final Environmental Statement Related to Operation of Maine Yankee Atomic Power Station," Directorate of Licensing, U.S. Atomic Energy Commission, July 1972

3. "Termination of Operating Licenses for Nuclear Reactors," Regulatory Guide 1.86, Directorate of Regulatory Standards, U.S. Atomic Energy Commission, June 1974

4. "Potential Radiation Dose to Man from Recycle of Metals Reclaimed from a Decommissioned Nuclear Power Plant," NUREG/CR-0134 and ORNL/NUREG/TM-215, Oak Ridge National Laboratory for U.S. Nuclear Regulatory Commission, December 1978

5. "Plan for Reevaluation of NRC Policy on Decommissioning of Nuclear Facilities," NUREG-0436 Rev. 1, Office of Standards Development, U.S. Nuclear Regulatory Commission, December 1978

6. "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," NUREG/CR-0130, Battelle Pacific Northwest Laboratory for U.S. Nuclear Regulatory Commission, June 1978; Addendum, August 1979

7. "Decommissioning Commercial Nuclear Facilities: A Review and Analysis of Current Regulations," NUREG/CR-0671, Pacific Northwest Laboratory and Battelle Human Affairs Research Centers for U.S. Nuclear Regulatory Commission, August 1979

8. "Decontamination and Decommissioning of Nuclear Facilities," Marilyn M. Osterhout, ed.; Proceedings of the American Nuclear Society topical meeting in Sun Valley, Idaho, September 16-20, 1979

9. "Residual Radioactivity Limits for Decommissioning - Draft Report," NUREG-0613, Office of Standards Development, U.S. Nuclear Regulatory Commission, October 1979

10. "Assuring the Availability of Funds for Decommissioning Nuclear Facilities - Draft Report," NUREG-0584 Rev. 1, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, December 1979

11. "Thoughts on Regulation Changes for Decommissioning - Draft Report," NUREG-0590 Rev. 1, Office of Standards Development, U.S. Nuclear Regulatory Commission, December 1979

12. "Financing Strategies for Nuclear Power Plant Decommissioning," NUREG/CR-1481, New England Conference of Public Utilities Commissioners, Inc./Temple, Barker & Sloan, Inc. for U.S. Nuclear Regulatory Commission, July 1980

13. "A Methodology for Calculating Residual Radioactivity Levels Following Decommissioning," NUREG-0707, Office of Standards Development, U.S. Nuclear Regulatory Commission, October 1980

14. "Draft Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," NUREG-0586, Office of Standards Development, U.S. Nuclear Regulatory Commission, January 1981

15. "Decontamination Processes for Restorative Operations and as a Precursor to Decommissioning: A Literature Review," NUREG/CR-1915 and PNL-3706 1D, WD, Pacific Northwest Laboratory for U.S. Nuclear Regulatory Commission, May 1981

16. "Monitoring for Compliance with Decommissioning Termination Survey Criteria," NUREG/CR-2082 and ORNL/HASRD-95, Oak Ridge National Laboratory for U.S. Nuclear Regulatory Commission, June 1981

17. "Technology and Cost of Termination Surveys Associated with Decommissioning of Nuclear Facilities," NUREG/CR-2441 and ORNL/HASRD-121, Oak Ridge National Laboratory for U.S. Nuclear Regulatory Commission, February 1982

18. "The Impacts of Early Retirement of Nuclear Power Plants: The Case of Maine Yankee," ESRG 82-91, Energy Systems Research Group, Inc., August 1982

19. "The Decommissioning of Nuclear Plants," International Atomic Energy Agency, August 1982

20. "Funding Nuclear Power Plant Decommissioning," 82-3, The National Regulatory Research Institute for U.S. Department of Energy, October 1982

21. "Assuring the Availability of Funds for Decommissioning Nuclear Facilities: Draft Report," NUREG-0584 Rev. 3, Office of State Programs, U.S. Nuclear Regulatory Commission, March 1983

22. "An Overview of Decommissioning Nuclear Power Plants," Atomic Industrial Forum, Inc., March 1983

23. "Decommissioning of Nuclear Generating Stations: A Policy Statement of the American Nuclear Society," ANS Document PPS-13, American Nuclear Society, May 1983

24. "Effects on Decommissioning of Interim Inability to Dispose of Wastes Offsite," Addendum 2 to NUREG/CR-0130, Pacific Northwest Laboratory for U.S. Nuclear Regulatory Commission, July 1983

25. "Decommissioning Cost Estimate for the Maine Yankee Atomic Power Station," M01-25-001-1, TLG Engineering, Inc. for Maine Yankee Atomic Power Company, October 1983 [MPUC 82-179/MYAPCO: EXH LAGUARDIA-1]

26. "Decommissioning," a compendium of articles, Critical Mass Energy Project and Nuclear Information and Resource Service, 1984

27. "Nuclear Power Plant Decommissioning Study for the Yankee Nuclear Power Station," Yankee Atomic Electric Company, April 1984

28. "Utility Financial Stability and the Availability of Funds for Decommissioning," NUREG/CR-3899, Engineering and Economics Research, Inc. for U.S. Nuclear Regulatory Commission, September 1984

29. "Classification of Decommissioning Wastes," Addendum 3 to NUREG/CR-0130, Pacific Northwest Laboratory for U.S. Nuclear Regulatory Commission, September 1984

30. "Comments on the Nuclear Regulatory Commission's Proposed Rule on Decommissioning," Michael Totten, Director, Public Citizen's Critical Mass Energy Project and on behalf of Environmental Action Foundation, September 1984

31. "Evaluation of Nuclear Facility Decommissioning Projects -- Annual Summary Report -- Fiscal Year 1984," NUREG/CR-4090, UNC Nuclear Industries for U.S. Nuclear Regulatory Commission, January 1985

32. "Decommissioning Criteria for Nuclear Facilities," Proposed Rule, FR50:28:5600, U.S. Nuclear Regulatory Commission, February 1985

33. "Dismantling the Myths about Nuclear Decommissioning," Sally Hindman, Public Citizen/Environmental Action, April 1985

34. "Updated Costs for Decommissioning Nuclear Power Facilities," EPRI NP-4012, Battelle, Pacific Northwest Laboratories for Electric Power Research Institute, May 1985

35. "Nuclear Power Plant Decommissioning Study for Millstone Unit No. 3," Northeast Utilities Service Company, June 1985

36. "Decommissioning: Nuclear Power's Missing Link," Worldwatch Paper 69, Cynthia Pollock for Worldwatch Institute, April 1986

37. "Maine Yankee Shutdown Assessment: A Report to Governor Joseph E. Brennan," Maine State Planning Office/Maine Office of Energy Resources/Maine Public Advocate, May 1986

38. "Maine Yankee Shutdown Assessment: Staff Papers and Correspondence," Maine State Planning Office/Maine Office of Energy Resources/Maine Public Advocate, May 1986

39. "Decommissioning of Nuclear Facilities: Feasibility, Needs and Costs" Nuclear Energy Agency, Organisation for Economic Co-operation and Development August 1986

40. "Nuclear Reactor Decommissioning: An Analysis of the Regulatory Environments," ORNL/TM-9638, Oak Ridge National Laboratory for U.S. Department of Energy, August 1986

41. "Report," Interstate (Mass., Me., N.H., Vt.) Task Group on Decommissioning of Nuclear Facilities, September 1986

42. "Maine Yankee Atomic Power Station In-Site Decommissioning/Low Level Waste Management Topical Report," APTR-42, Ebasco Services, Inc. for Maine Yankee Atomic Power Company, January 1987

43. "Decommissioning Study for the Connecticut Yankee Automic Power Company Nuclear Generating Station," Northest Utilities Service Company, March 1987

44. "Maine Yankee Atomic Power Station: LLW Conversion Study," Preliminary Draft, TLG Engineering, Inc. for Maine Yankee Atomic Power Company, March 1987

45. "A Technology Assessment Methodology for Electric Utility Planning: With Application to Nuclear Power Plant Decommissioning," W. Timothy Lough for Virginia State Corporation Commission, May 1987

46. "Waste Management for Shippingport Station Decommissioning Project: Extended Summary," CONT-870306--12-Summ., General Electric Company Nuclear Energy Business Operations for U.S. Department of Energy, July 1987

47. "Reference Guide to the Funding and Taxation Aspects of Nuclear Decommissioning," National Association of Regulation Utility Commissoners, August 1987