NR-AIG-003

Financial Implications of Retrospective Premium Assessments on Electric Utilities

U.S. Nuclear Regulatory Commission

8101280074

Available from
National Technical Information Service
Springfield, Virginia 22161
Price: Printed Copy $4.00 ; Microfiche $2.25

NR-AIG-003

Financial Implications of Retrospective Premium Assessments on Electric Utilities

Ronald W. Melcher*

Manuscript Completed: May 1976
Date Published: September 1976

*Associate Professor of Finance
Graduate School of Business Adminstration
University of Colorado
Boulder, Colorado 80302

U.S. Nuclear Regulatory Commission

TABLE OF CONTENTS

I. INTRODUCTION

In the mid-1950's, a decision was reached to encourage involvement by private enterprise in the area of nuclear power. The passage of the Atomic Energy Act of 1954 removed nuclear energy restrictions imposed on private individuals and organizations under the Atomic Energy Act of 1946. Then in 1957, the Price-Anderson Act[1] was established to encourage private industry involvement in nuclear power through government indemnity provisions designed to absorb possible enormous liability claims. A second objective was to provide assurance that adequate compensation would be available to the public to cover possible damages associated with a serious nuclear incident. An extension of the Price-Anderson Act in 1965 provided continued nuclear liability coverage through July 31, 1977.

In recent years, however, discussions and hearings have focused on possible alternatives to (or modifications of) the Price-Anderson Act. Included were proposals involving the use of contingency fees or retrospective premiums.[2] Bill H.R. 8631 was enacted as Public Law 94-197 by the United States Congress in December 1975. This Bill amends the Atomic Energy Act of 1954, as amended, with particular changes occurring in Section 170 involving the existing Price-Anderson Act. A ten-year extension of the Act, until August 1, 1987 is provided.

Bill H.R. 8631 provides for a three-tier system to assure adequate compensation to the public to cover liability damages in the event of a nuclear accident. Previously, the Price-Anderson system incorporated only two tiers. First, is a layer of financial protection (currently $125 million in coverage is

---

[1] Public Law 85-256, 71 Stat. 576 (1957). The term "Price-Anderson Act" is used to refer to Section 170 of the Atomic Energy Act of 1954, as amended, as well as amendments to this Section that relate to financial protection and indemnity.

[2] For further elaboration, see: Ronald W. Melicher, "The Price-Anderson Act: Finance and Accounting Implications Associated with the Possible Phasing Out of Government Indemnity Provisions," Office of Antitrust & Indemnity, Atomic Energy Commission, March 1974; or Ronald W. Melicher, "Nuclear Liability Insurance for Electric Utilities," Public Utilities Fortnightly (May 22, 1975), pp. 15-20.

available) provided by private insurance pools (NELIA and MAELU). This initial protection is the same under either the two-tier or three-tier systems.

The second tier of the two-tier system provided for government indemnification of nuclear accidents resulting in liability claims beyond the amounts covered by the first-tier private insurance. A limit of $560 million was placed on total liability claims by the public per accident.

In the three-tier system, the second tier of coverage is based on a deferred retrospective premium concept. Bill H.R. 8631 directs the Nuclear Regulatory Commission to administer a retrospective premium, in an amount between $2 and $5 million, for each licensed facility following a nuclear accident. The assessed payments would be made to the insurance company pools whenever liability damages exceeded the coverage amount contained in the first tier of protection. The third tier would provide for government indemnity assistance to cover differences (if any) between $560 million and the amount of combined coverage available under the first two tiers of the system. This third tier is expected to diminish and possibly disappear as more nuclear facilities are licensed (and retrospective premiums established) over time.

Now that H.R. 8631 has been enacted into law, the Nuclear Regulatory Commission, through a rule-making procedure, must establish certain operating constraints and requirements. For example, in the event of a nuclear incident, the size of the retrospective premium to be assessed against each utility for each reactor must be established. A decision also must be reached concerning the number of times such an assessment could be made per year.

This study is designed to serve as an aid to the rule-making decision process. The impact of alternative retrospective premium assessment levels on financial data is examined, with the possible impact of such assessments on the financial well-being of involved utilities being of particular concern. Of corresponding interest is the possibility that adequate cash funds may not be readily available when a retrospective premium is assessed. This suggests, in turn, a need to consider possible methods for guaranteeing the retrospective premiums.[3]

---

[3]This study is, in part, an extension of previous research completed for the U.S. Atomic Energy Commission. See the references in footnote 2.

Section II contains a brief review of the present financial condition of the electric utility industry, while Section III is concerned with future capital requirements for the industry. Information relating to financial condition and financing requirements is important to evaluate the ability to meet retrospective premium assessments. Section IV focuses on recent relevant accounting developments and examines the impact of various retrospective premium assessment policies on electric utility financial and accounting statements and cash flow operating levels. Possible ways of assuring funds will be available for meeting assessments are reviewed in Section V. The study culminates with a summary statement and specific conclusions in Section VI.

II. PRESENT FINANCIAL CONDITION OF THE ELECTRIC UTILITY INDUSTRY

Regulation of public utilities is carried out in accordance with the following equation: $R = E + (V - d)r$.[4] Revenues (R) allowed to be earned are a function of expenses (E)--including operating expenses, depreciation, and taxes; and the adjusted total assets or rate base (V) less the accrued depreciation (d) already considered in the expenses, multiplied by the allowed rate of return (r) measured as the weighted average cost of debt and equity capital. In order to entice private industry to make capital asset investments, they must have the opportunity of achieving returns that not only will cover the costs associated with the investment but will also provide a return to the owners that is satisfactory in light of the investment risk.

Economic theory contends that investors are risk adverse and that there exists a trade-off relationship between risk and expected return. In brief, investors must expect to receive higher returns as compensation for their willingness to assume greater risks. Consequently, in an efficient capital markets environment, the ability to attract and maintain capital must be achieved in a risk-return setting.

---

[4] For a more comprehensive but less current examination of the electric utility industry, see: Ronald W. Melicher, "Financial Considerations and Implications for Nuclear Energy Centers," Office of Special Studies, U.S. Nuclear Regulatory Commission (August 1975).

Risk-return considerations are an important part of regulation with legal precedence being established in the Bluefield and Hope cases.[5] A fair rate of return was defined as one which is: (1) adequate to maintain credit-worthiness and financial integrity; (2) sufficient to attract new capital and maintain existing capital; and (3) commensurate with returns earned by other firms having similar or corresponding risks.

Risk considerations generally focus on the operations of the firm (business risk) and how the firm is financed (financial risk) and when combined constitute an overall firm risk. Evidence suggests an increase in both business and financial risks in the investor-owned segment of the electric utility industry in recent years. Table 1 depicts the decline in equity returns for class A (annual electric operating revenues of $2,500,000 or more) and B (revenues between $1,000,000 and $2,500,000) electric utilities since the mid-1960s. Federal Power Commission data for 1974 (the most recently available data) indicates a rate of return on common equity of only 10.7% compared against 12.6% in 1965.

At the same time that equity returns have been falling, there has been a decline in common equity as a percentage of total capitalization for class A and B electric utilities. In other words, there has been an increasing use of long-term debt and preferred stock to finance assets. This trend, along with high interest rates, has resulted in rising "embedded" debt costs and declining interest coverage ratios. Concern also has been expressed over a deterioration in the "quality" of earnings in the electric utility industry.[6]

The impact of these trends and developments are apparent in the deterioration in the quality of electric utility debt as reflected in Standard & Poor's bond ratings. Table 2 indicates that few electric utilities were able to maintain AAA ratings. More significantly, of the 131 electric utilities

---

[5] Bluefield Water Works and Improvement Company v. Public Service Commission of West Virginia, 262 U.S. 679, 692-3 (1923), and Federal Power Commission v. Hope Natural Gas Company, 320 U.S. 591, 603 (1944).

[6] Federal Power Commission, A Study of the Electric Utility Industry (Office of Accounting and Finance, September 1974), p. 10.

TABLE 1

RATES OF RETURN ON COMMON EQUITY OF CLASS A AND B ELECTRIC UTILITIES

Year	Earnings Available for Common Stock as a Percent of Average Common Equity
1965	12.6%
1966	12.8
1967	12.8
1968	12.3
1969	12.2
1970	11.8
1971	11.7
1972	11.8
1973	11.5
1974	10.7

Source: Federal Power Commission, Statistics of Privately Owned Electric Utilities in the United States, selected annual issues.

TABLE 2

STANDARD AND POOR'S BOND RATINGS FOR CLASS A AND B ELECTRIC UTILITIES

Ratings on Mortgage Debt	1965		1975	
	Number	Percent	Number	Percent
AAA	16	12.2%	3	2.3%
AA	63	48.1	41	31.3
A	47	35.9	59	45.0
BBB	5	3.8	28	21.4
Total Rated	131	100.0%	131	100.0%

Source: Author's calculations.

with bond ratings listed in both 1965 and 1975, 79 were in the highest two rating categories in 1965 in contrast with only 44 by the end of 1975.

There exists, however, reason for optimism in light of the recovering economy and recent regulatory actions. Evidence suggests that the downward trend has bottomed-out and conditions are starting to improve. Many electric utilities are reporting higher earnings per shares (over the depressed 1974 levels), higher revenues, and improved coverage ratios.[7]

III. ELECTRIC GENERATING CAPACITY AND CAPITAL REQUIREMENT FORECASTS

The Atomic Energy Commission prepared several forecasts of both total electric and nuclear generating capacity through the year 2000 during 1974.[8] Case A, the AEC's most conservative 1974 forecast, and several other forecast attempts are summarized in Table 3. It should be noted that no attempt was made to standardize the forecasts on the basis of assumptions, constant dollars versus current dollars, and so forth.

Some similarity exists among the Technical Advisory Committee on Finance's (TACF-NPS) "moderate growth" forecast, Electrical World's forecast, and the Atomic Energy Commission's Case A forecast in terms of future electric generating capacity. Estimates of nuclear generating capacity, however, are not available from the former two forecasts. And, the other three forecasts (1970 NPS, Hass, and TACF-NPS "preliminary") of nuclear generating capacity are of limited value because they are based on much higher estimates of total electric generating capacity. They tend to represent historic demand growth rates.

---

[7] For example, see: Federal Power Commission, "News Release No. 22052 (FPC Reports Higher Revenues for Private Electric Utilities in September 1975)," January 12, 1976; and "Electric Utilities Appear Financially Healthier as Bond-Coverage Ratios Show Improvement," Wall Street Journal (December 23, 1975), p. 23.

[8] Atomic Energy Commission, Nuclear Power Growth, 1974-2000 (Washington: U.S. Government Printing Office, WASH-1139(74), February 1975), pp. 1-4.

TABLE 3

COMPARISON OF ELECTRIC GENERATING CAPACITY FORECASTS
(Thousands of Megawatts)

Year	1970 NPS[a]	Hass[b]	Preliminary[c]	Moderate Growth[d]	Electrical World[e]	ERDA Mod./ Low Growth[f]	WASH-1139(74) Case A[g]
Total Capacity							
1980	665	670	651	613	624	620	655
1985	--	935	900	813	781	800	800
1990	1,260	1,383	1,239	1,062	1,003	1,040	1,040
1995	--	--	--	--	1,349	--	1,280
2000	--	--	--	--	--	1,750	1,575
Nuclear Capacity							
1980	140	146	136	NA	NA	76	85
1985	--	297	285	NA	NA	185	231
1990	475	562	526	NA	NA	340	410
1995	--	--	--	--	NA	--	620
2000	--	--	--	--	--	800	850

[a] Federal Power Commission, The 1970 National Power Survey, Part I ,Washington: U.S. Government Printing Office, December 1971), p. I-18-2.

[b] Jerome Hass, Edward Mitchell, and Bernell Stone, Financing the Energy Industry (Cambridge: Ballinger Publishing, 1974), Chapter 4 and p. 115.

[c] Howard Pifer and Michael Tennican, "A Description of a Policy-Testing Model of the Electric Utility Industry, "(Technical Advisory Committee on Finance - National Power Survey, September 23, 1973).

[d] Federal Power Commission, The Financial Outlook for the Electric Power Industry (Technical Advisory Committee on Finance--National Power Survey, December 1974), p. 73.

[e] Leonard Olmstead, "25th Annual Electrical Industry Forecast," Electrical World (September 15, 1974), p. 54.

[f] Roger W. A. Legassie, "Testimony," Hearings on Growth Rates of Electricity and the Role of Nuclear Energy before the Subcommittee on Energy and the Environment of the United States Committee on Interior and Insular Affairs, April 28, 1975.

[g] Atomic Energy Commission, WASH-1139(74), p. 6.

The Technical Advisory Committee on Finance also provided estimates of future construction expenditures. Some perspective on future financing requirements can be gained by examining the financing requirements associated with the TACF-NPS's "moderate growth" forecast (which, as previously noted), corresponds reasonably well with the AEC's 1974 Case A total generating capacity forecast. Table 4 indicates expenditure requirements under the assumption of moderate growth in demand (5.5%-6.5%) along with high escalation of construction costs and either high or low environmental costs.

Construction expenditures are expected to range between $656 billion and $688 billion (depending on environmental cost trends) over the 1975 through 1989 period. External financing will be $394-$412 billion or approximately 60% of the total financing requirements. An important assumption in these projections is that returns on common equity will be on the order of 14%--a level not currently being achieved by the electric power industry (see Section II of this study). Future capital requirements are also placed in greater perspective when compared to the $83 billion spent for construction during the first half of the 1970s (1970-74).[9] Electric utilities must be competitive in the capital markets if the future financing needs are to be met.

Recent evidence suggests, however, that even the Atomic Energy Commission's 1974 Case A conservative forecast seems to have over-estimated at least near-term nuclear generating capacity. Current estimates as to the number of nuclear reactors in operation by year are provided in Table 5.[10] These estimates are particularly important in light of the intent to phase out Government indemnity by 1985. Based on an estimated 174 nuclear reactors in operation in 1985, a $2 million retrospective premium assessment per reactor would not be adequate to phase out Government indemnity. Phase out could occur under a $3 million assessment per reactor if current forecasts are realized. A $4-$5 million assessment rate would, of course, provide greater phase out assurance in the event of further construction delays.

---

[9] Federal Power Commission, The Financial Outlook for the Electric Power Industry (Technical Advisory Committee on Finance--National Power Survey, December 1974), pp. 23-24.

[10] Several Nuclear Regulatory Commission staff groups are currently involved in developing revised estimates.

TABLE 4

TACF-NPS FORECAST OF EXPENDITURE REQUIREMENTS FOR THE U.S. ELECTRIC POWER INDUSTRY

($ Billions)

MODERATE GROWTH IN DEMAND

	High Environmental Costs		Low Environmental Costs	
	Construction Expenditures	External Financing	Construction Expenditures	External Financing
1975-79	$ 129	$ 80	$ 116	$ 69
1980-84	218	132	208	128
1985-89	341	200	332	197
1975-89	688	412	656	394

Note: These expenditures are expressed in "future" dollars (i.e., actual dollars, reflecting expected inflation, that are expected to be spent in a future period). External financing includes short-term borrowings, but excludes refundings.

Source: Federal Power Commission, The Financial Outlook for the Electric Power Industry (TACF-NPS), December 1974, p. 26.

TABLE 5

FORECAST OF NUMBER OF NUCLEAR REACTORS IN OPERATION

Year	Number
1977	72
1978	77
1979	79
1980	86
1981	98
1982	116
1983	134
1984	151
1985	174
1986	196
1987	216
1988	238
1989	262
1990	285

Source: Nuclear Regulatory Commission Staff.

IV. FINANCIAL AND ACCOUNTING IMPACT OF RETROSPECTIVE PREMIUM ASSESSMENT POLICIES

This section first reviews recent accounting developments pertinent to accounting for contingencies such as nuclear liability claims. Attention then turns towards examining the likely impact of retrospective premium assessments on the financial well-being of electric utilities. A sensitivity analysis is conducted to appraise differential assessment policies.

Recent Accounting Developments

In March 1975, the Financial Accounting Standards Board issued a statement (Number Five) titled "Accounting for Contingencies." This Statement defined a contingency as: "....an existing condition, situation, or set of circumstances involving uncertainty as to possible gain or loss to an enterprise that will ultimately be resolved when one or more future events occur or fail to occur."[11] The risk of loss or damage of property by explosion, fire, or other hazards represents one example of a loss contingency according to Statement No. 5.

Under certain conditions it is possible to provide for an accounting accrual of loss contingencies. Specifically, it is possible to accrue an estimated loss in the form of charge against income if two conditions are met. These conditions are:

"a) Information available prior to issuance of the financial statement indicates that it is probable that an asset had been impaired or a liability had been incurred at the date of the financial statements. It is implicit in this condition that it must be probable that one or more future events will occur confirming the fact of the loss.

b) The amount of loss can be reasonably estimated."[12]

The uncertainty associated with possible liability claims arising from nuclear incidents (in terms of when or if, amount,

---

[11] Financial Accounting Standards Board, "Accounting for Contingencies," in Accounting, Current Text (Chicago: Commerce Clearing House, 1975), p. 9181.

[12] Ibid., p. 9184.

etc.) is such that the use of the accounting accrual method would be questionable.

Even though a loss contingency may not qualify for application of the accounting accrual approach, Statement No. 5 provides for disclosure of the contingency if there is a reasonable possibility that a loss may be incurred. Specifically, "the disclosure shall indicate the nature of the contingency and shall give an estimate of the possible loss or range of loss or state that such an estimate cannot be made."[13] Thus, recognition or disclosure of possible liability claims stemming from a nuclear incident would seem to be necessary even under a retrospective premium assessment program. Disclosure might involve the use of an explanatory footnote to retained earnings on the utility's balance sheet.

The "appropriation" of some portion of retained earnings for possible loss contingencies represents another method sometimes used. Statement No. 5 concludes:

> "Appropriation of retained earnings is not prohibited by this Statement provided that it is shown within the stockholders' equity section of the balance sheet and is clearly identified as an appropriation of retained earnings. Costs or losses shall not be charged to an appropriation of retained earnings, and no part of the appropriation shall be transferred to income."[14]

The appropriation method thus is another way of disclosing or recognizing possible future loss obligations.

Some confusion exists between accounting accruals and the actual setting aside of specific assets such as cash for purposes of meeting contingency losses. For example, the Financial Accounting Standards Board states:

> "Accounting accruals are simply a method of allocating costs among accounting periods and have no effect on an enterprise's cash flow. An enterprise may choose to maintain or have access to sufficient liquid assets to replace or repair lost or damaged property or to pay claims in case a loss occurs."[15]

---

[13] Ibid., pp. 9184-9185

[14] Ibid., pp. 9186-9187

[15] Ibid., p. 9202.

Thus, a utility could set aside or segregate cash or other liquid assets such as marketable securities in order to provide for possible retrospective premium assessments. This segregation of liquid assets could be shown directly on the balance sheet or through footnotes to liquid asset accounts. In the event of an assessment, these segregated assets would be reduced and a corresponding amount "expensed" on the income statement. It would be possible to combine this approach with the "appropriation" of some portion of retained earnings, if desired, but this would not be necessary.

Potential Nuclear Involvement by Electric Utilities

A large number of electric utilities are currently involved or are planning involvement in nuclear power generation facilities. Table 6 identifies fifty privately-owned electric utilities which will be involved according to a 1974 Atomic Energy Commission study.[16] These utilities are grouped on the basis of their 1974 total revenues into small, medium, and large size utilities to aid in examining the likely impact of retrospective premium assessments on their financial well-being.

A number of the fifty utilities identified in Table 6, as well as other investor-owned companies, are involved or planning participation in joint nuclear reactor ownership arrangements. The "Yankee" companies in New England established an early approach to joint ownership. For example, twelve investor-owned utilities organized the Yankee Atomic Electric Company in 1954 to:

> "provide a broader economic base for sharing the large financial burden and risk associated with a nuclear generating station. Thirty-five percent of the total cost of the Yankee Atomic plant was financed by sales of common stock to the sponsoring companies. Entitlement to the capacity and energy from the plant is in proportion to their respective equity investments. The remaining cost of the plant was financed through a combination of bonds and bank loans by Yankee Atomic. Three more "Yankee" companies have been formed with essentially similar organizational structures."[17]

---

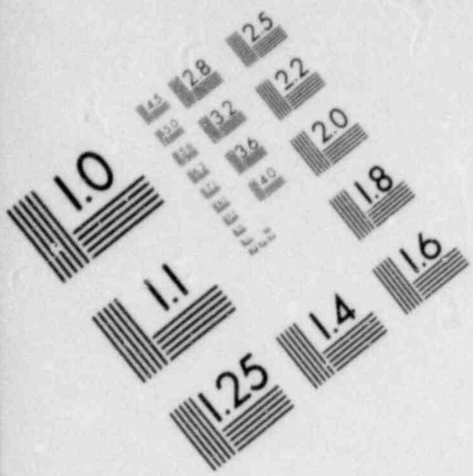
[16] Atomic Energy Commission, Nuclear Power Growth, 1974-2000 (Washington: U.S. Government Printing Office, WASH-1139(74), February 1974).

[17] Federal Power Commission, The 1970 National Power Survey, Part I (Washington: U.S. Government Printing Office, December 1971), pp. I-20-11 and I-20-12.

TABLE 6

NUCLEAR POWER REACTOR INVOLVEMENT BY INVESTOR-OWNED ELECTRIC UTILITIES

Revenue Size	Electric Utility	Total Revenues for 1974 ($ millions)	Number of Operating and/or Planned Reactors
Small			
1	Kansas G. & E.	$ 96.4	1
2	Iowa Electric L. & P.	119.2	1
3	Puget Sound P. & L.	142.4	1
4	Toledo Edison	147.8	3
5	P.S. of New Hampshire	155.9	2
6	Portland G. & E.	175.0	3
7	Rochester G. & E.	234.0	2
8	Delmarva P. & E.	261.9	2
9	Arizona Public Serv.	273.6	3
10	S. Carolina E. & G.	279.6	2
11	N.Y. St. E. & G.	296.0	2
12	Duquesne Light	324.9	3
13	Illinois Power	329.9	2
14	Public Serv. Co. of Colorado	363.7	1
15	Gulf States Utilities	369.6	4
			32
Medium			
16	Florida Power	405.0	1
17	Cincinnati G. & E.	416.1	2
18	Wisconsin El. Power	431.6	8
19	Potomac El. Power	441.9	2
20	Northern Indiana P.S.	448.7	1
21	Boston Edison	460.7	3
22	Carolina P. & L.	461.0	7
23	Cleveland Electric	463.9	2
24	Union Electric	468.7	2
25	Houston L. & P.	486.8	5
26	Ohio Edison	498.4	2
27	Northern States Power	544.8	5
28	Pennsylvania P. & L.	575.0	4
29	New England El. Sys. (HC)	586.2	2
30	Long Island Lighting	586.5	3
31	Central & South West (HC)	595.1	1
32	Baltimore G. & E.	608.8	2
33	Northeast Util. (HC)	653.3	3
34	Texas Util. (HC)	726.6	2
35	Virginia El. Power	764.0	8



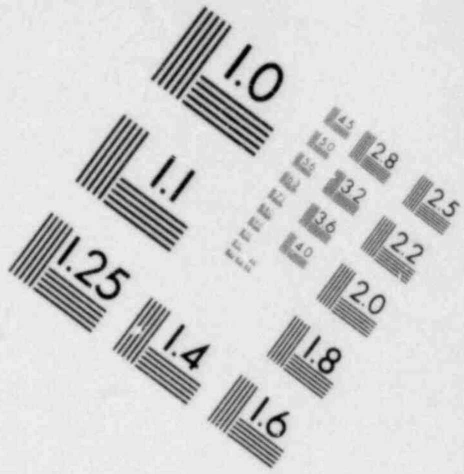
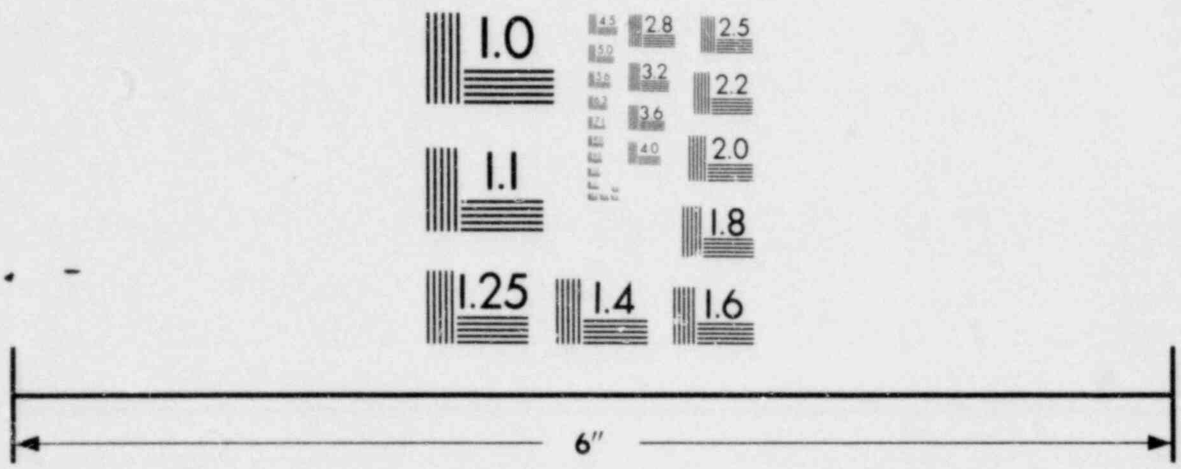
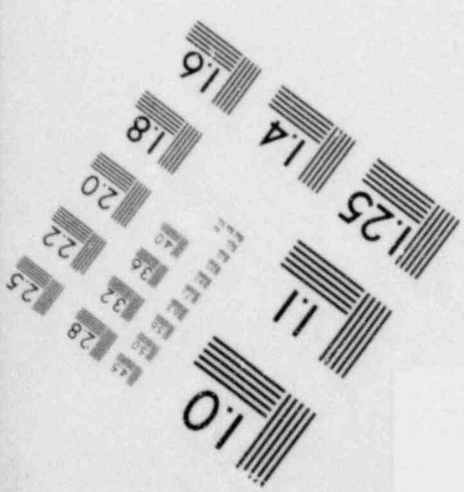
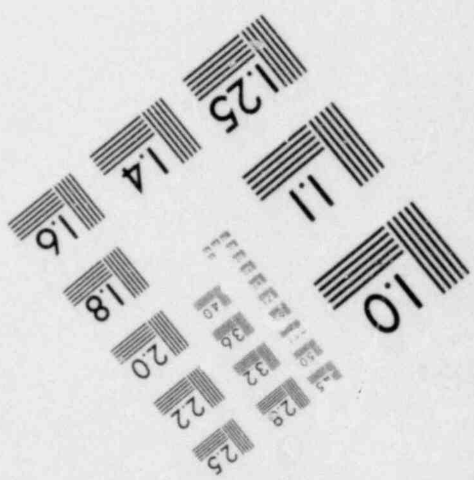
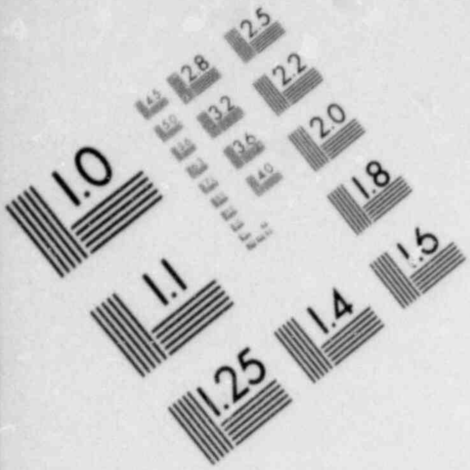


IMAGE EVALUATION TEST TARGET (MT-3)









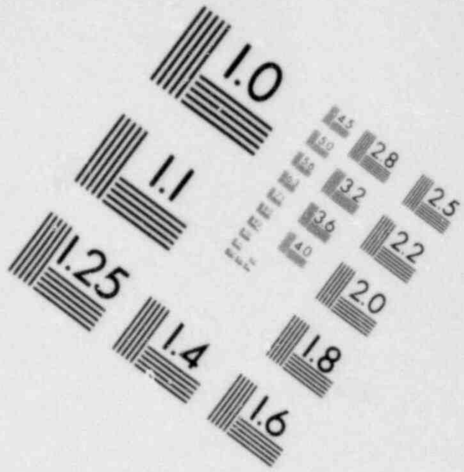
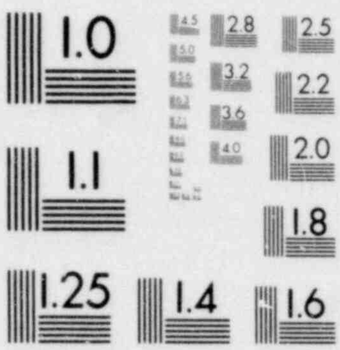
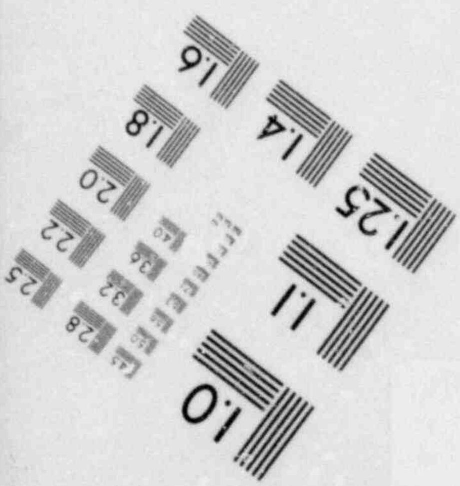


IMAGE EVALUATION TEST TARGET (MT-3)



6″



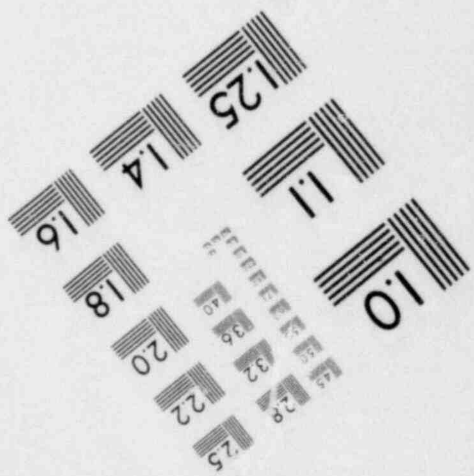


TABLE 6 (Continued)

Revenue Size	Electric Utility	Total Revenues for 1974 ($ millions)	Number of Operating and/or Planned Reactors	
Medium				
36	Middle South Util. (HC)	$ 821.5	7	
37	Duke Power	822.9	13	
38	Niagra Mohawk P.	830.8	2	
39	General Pub. Util. (HC)	862.4	5	
40	Detroit Edison	898.5	4	
				96
Large				
41	Florida P. & L.	951.1	4	
42	Philadelphia E.	1011.7	7	
43	Consumers Power	1105.4	6	
44	American El. Power (HC)	1316.1	2	
45	P.S. Electric & Gas	1455.9	8	
46	Commonwealth Edison	1459.6	17	
47	Southern Calif. Edison	1483.4	7	
48	Southern Co. (HC)	1489.0	10	
49	Pacific G. & E.	1726.8	5	
50	Consolidated Edison	2439.5	3	
				69
				197

Source: Atomic Energy Commission, WASH-1139(74). 1974 Revenues are from The Value Line Investment Survey May 9, 1975.

More recent and planned ownership arrangements generally do not involve formation of new companies. Rather, participating utilities own a portion or percentage of a nuclear reactor and thus would incur their pro rata share of the liability in the event of an assessment. This sharing of possible financial burden and risk is consistent with reasons cited for forming such joint arrangements. Thus, under such arrangements, the burden of retrospective premium assessments would be lessened due to sharing agreements.

The involvement of Federal, public non-Federal, and cooperative systems in terms of nuclear power generating units also must receive some attention since the assessment of retrospective premiums would apply to nuclear reactors in operation by those systems. Potential involvement by co-ops and municipal utilities is further signified by their trend towards sharing in joint ownership arrangements.

Retrospective Premium Assessments

Retrospective premiums are designed to be assessed only in the event of a nuclear incident and only to the extent that private insurance coverage is inadequate to cover the size of the liability claims. In essence, then, this second tier of coverage represents a "joint" pool of coverage that may be called upon in the event of a disaster. For such a system of a "pool of self-insurance" to work, it is important that funds be available in the event the need arises. Consequently, it is necessary to assess the impact of retrospective premium assessments on the financial well-being of electric utilities.

In the event that the assessment of retrospective premiums actually occurs, the immediate impact or repercussion will be on the profitability and cash flows of electric utilities possessing nuclear reactors.[18] The regulatory equation, $R = E + (V - d)r$, discussed in Section II can be used to describe the impact. Revenues allowed to be earned to provide a "fair" return under anticipated operating conditions would be affected by the assessment of retrospective premiums in the period assessments occur. In essence, the allowed revenues probably would not reflect the expectation of these added "expenses."

A variety of assessment policies are possible and will, of course, have differential impacts on financial and accounting statements. For example, one approach would be to charge a level retrospective premium against each nuclear reactor in operation at the time of the nuclear incident. Possible assessments between $2 million and $5 million per reactor might be instituted. The amount of the assessment depends largely upon the rate at which it is desired to diminish the role of the third tier (government indemnification) in the three-tier system. Actually, on the basis of current forecasts, at least a $3 million assessment per reactor would be necessary to phase out Government indemnity by 1985. Assessments closer to the

[18] The discussions in this study focus only on the impact of retrospective premium assessments in the event of a nuclear incident. The electric utility, at whose nuclear plant the incident occurs, is likely to suffer even more due to the need to purchase replacement power caused by possible prolonged inoperation of the plant.

$5 million rate might be necessary if there are further slowdowns in nuclear reactors in operation estimates.

Some insight into the financial and accounting data impact of retrospective premium assessments is shown in Table 7. Four electric utilities (Duquesne Light, Public Service Company of Colorado, Northern States Power, and Commonwealth Edison) were selected from the fifty investor-owned electric utilities identified in Table 6. They represent two relatively small, one medium, and one large utility, respectively, in terms of revenues.

Table 7 shows the impact of single $3 million and $5 million assessments based on each utility's income statement data taken from 1975 annual reports. It is important to note that these examples are conservative in that the impact of the assessments will diminish in the future as the electric utilities continue to "grow." The industry's financial condition also may continue to improve in the future.

As would be expected, a level assessment would impact more on smaller utilities. On the basis of a single reactor and assuming immediate full payment of the assessment, Duquesne Light would suffer a decline in E.P.S. of $.08-$.14 compared with a $.10-$.17 decline for Public Service of Colorado. The impact on Northern States Power would be $.06-$.11 in E.P.S., whereas Commonwealth Edison would suffer only a $.03-$.05 decline in E.P.S. A similar pattern of impact across the four utilities also would occur in terms of interest coverage ratios and rates of return on common equity measures. On the other hand, larger utilities are more likely to be involved in a number of nuclear reactors and thus a retrospective premium assessment might impact heavily even on very large utilities. For example, Commonwealth Edison with two nuclear reactors would be affected about the same as Northern States Power with one reactor. Further sensitivity analysis will be conducted later.

The impact of retrospective premium assessments also needs to be examined in terms of cash flows in addition to financial and accounting statement data since the ability to meet such obligations represents a cash flow problem. Estimates of the cash flows for the four utilities were made from each company's "statement of changes in consolidated financial position" contained in the 1975 annual reports. Net cash flows are presented in Table 8. The source of funds from operations was first calculated. Depreciation and depletion amounts, along

TABLE 7

FINANCIAL IMPACT OF RETROSPECTIVE PREMIUM ASSESSMENTS

1975 Income Statement Data ($ millions)	Duquesne Light	Public Service Co. of Colorado	Northern States Power	Commonwealth Edison
Total Operating Revenues	$405.12	$463.63	$675.36	$1722.33
Earnings Before Interest & Taxes	154.03	114.72	227.88	502.38
Interest	49.26	36.85	65.56	149.27
Earnings Before Taxes	104.77	77.87	162.32	353.11
Income Taxes	33.25	20.77	71.20	146.20
Net Income	71.52	57.10	91.12	206.91
Preferred Stock Dividends	12.86	10.60	14.54	42.79
Earnings Available to Common Stockholders	58.66	46.50	76.59	164.12
Common Equity ($ millions)	484.79	402.63	771.13	1566.96
1975 Effective Income Tax Rate	31.74%	26.67%	43.86%	41.40%
Number of Shares of Common Stock Outstanding (millions)	24.74	21.41	25.96	55.68
Earnings Per Share	$ 2.37	$ 2.17	$ 2.95	$ 2.95
Interest Coverage (net income plus interest)/interest	2.45x	2.55x	2.39x	2.39x
Rate of Return on Common Equity	12.10%	11.55%	12.34%	10.47%
Impact of Retrospective Premiums (i.e., a before tax "expense")				
$3 Million Assessment				
Earnings Per Share	$ 2.29	$ 2.07	$ 2.89	$ 2.92
Interest Coverage	2.41x	2.49x	2.36x	2.37x
Return on Common Equity	11.68%	11.00%	12.07%	10.36%
$5 Million Assessment				
Earnings Per Share	$ 2.23	$ 2.00	$ 2.84	$ 2.90
Interest Coverage	2.38x	2.45x	2.35x	2.37x
Return on Common Equity	11.39%	10.64%	11.89%	10.29%

Source: 1975 Annual Reports

TABLE 8

CASH FLOW IMPACT OF RETROSPECTIVE PREMIUM ASSESSMENTS

1975 Annual Report Data ($ millions)	Duquesne Light	Public Service Co. of Colorado	Northern States Power	Commonwealth Edison
Source of Funds From Operations				
Net Income	$71.52	$57.10	$91.12	$206.9[illegible]
Depreciation and Depletion	33.00	43.10	93.58	216.9[illegible]
Deferred Income Taxes and Investment Tax Credits	18.24	11.09	35.66	105.18
Allowance For Funds Used During Construction	(25.25)	(11.28)	(23.15)	(48.13)
Other	.68	.00	.00	(6.45)
Total	98.19	100.01	197.21	474.48
Application of Cash Funds				
Preferred Stock Dividends	12.86	10.60	14.54	43.32
Common Stock Dividends	42.83	26.58	48.82	129.95
Total	55.69	37.18	63.36	173.33
Estimate of Net Cash Flow (i.e., sources less applications)	$42.50	$62.83	$133.85	$301.15
Cash Flow Per Share	$1.72	$2.93	$5.16	$5.41
Impact of Retrospective Premiums (i.e., a before tax "expense")				
$3 Million Assessment				
Net Cash Flow ($ millions)	$40.45	$60.63	$132.17	$299.40
Cash Flow Per Share	$1.64	$2.83	$5.09	$5.38
$5 Million Assessment				
Net Cash Flow ($ millions)	$39.08	$59.17	$131.05	$298.23
Cash Flow Per Share	$1.58	$2.76	$5.05	$5.36

Source: 1975 Annual Reports

with deferred income taxes and investment tax credits, were added back to net income to initially estimate cash flows. Next, an "allowance for funds used during construction" amount had to be subtracted since it does not represent actual cash inflows. Small adjustments for a so-called "other" category also were made. Finally, the deduction of cash payments for preferred stock and common stock dividends results in an estimated net cash flow.

Since a retrospective premium assessment affects net income, it also will impact on a utility's cash flow. The impact, under the assumption of a before tax "expense," will be equivalent to the amount of the assessment times one minus the effective tax rate. Thus, net income will be lowered (as was the situation in the Table 7 calculations) and a corresponding reduction in net cash flow would occur. The net cash flow, in dollar amount and on a per share basis, is much lower for Duquesne Light and Public Service of Colorado relative to the other two electric utilities. A single retrospective premium assessment would "cost" Duquesne Light between $2.05 million and $3.42 million or would result in a 5%-8% reduction in the utility's 1975 net cash flow position. The cash flow impact for Public Service of Colorado would be in the 3%-6% reduction range. While a single assessment would impact even less on the cash flows of the two larger utilities, the burden would increase with the number of nuclear reactors in operation at the time of a nuclear incident.

Sensitivity Analysis of Assessment Policies

The previous analysis shows that a single assessment of $5 million would cause less than a 10% decline in the current cash flows of smaller electric utilities such as Duquesne Light and Public Service of Colorado. Of course, as was noted in Table 6, several investor-owned utilities smaller than Duquesne Light have nuclear reactor plans. For example, Toledo Edison has plans for involvement in three future nuclear reactors. But, like many other electric utilities, Toledo Edison has plans for joint ownership arrangements whereby it will own only approximately one-half of one reactor and a much lower percentage of the other two planned reactors. Thus, Toledo Edison would be liable only for its pro-rata share of reactor assessments. This type of risk spreading would enhance the ability to meet assessment obligations.

The impact of retrospective premium assessments will be compounded by the fact that each utility (or a group involved in a joint effort) will be assessed a premium for each reactor it has in operation at the time a nuclear incident occurs. Furthermore, although unlikely, more than one nuclear incident might occur in a given year. These possibilities suggest the need for a sensitivity analysis.

Table 9 shows the impact per reactor for both $3 million and $5 million assessments on financial and accounting data and cash flow amounts. The sensitivity is depicted as the "number of reactors covered" and is calculated by dividing the appropriate 1975 data (e.g., E.P.S.) by the impact per reactor (e.g., impact on E.P.S.). This provides some indication as to the possible impact of assessments against multiple reactors and/or assessments for more than one nuclear incident per year. Of course, this represents a "severe" case analysis. Actual assessments are likely to be tempered because of risk spreading under joint ownership arrangements and because actual claims emanating from a nuclear incident might be spread out over a number of years. Regulatory authorities also might permit electric utilities to recover assessment "costs" over a number of years.

According to the previously cited Atomic Energy Commission's study, WASH-1139-74, Duquesne Light is jointly licensed with other utilities for one operational nuclear reactor and one in the planning stages for the future. Public Service of Colorado has only one solely-owned nuclear reactor. Northern States Power of Minnesota has two operational and three planned nuclear reactors, while Commonwealth Edison projects a total of seventeen nuclear reactors (six are operational and eleven are planned). According to Table 9, current cash flows for each utility would be adequate to cover retrospective premium assessments for reactors currently in operation. Current cash flows also would be adequate (to cover assessments) even if planned reactors were placed into operation. For example, Duquesne Light has a cash flow position adequate to cover 12 reactors (or fewer reactors assessed more than once) at a $5 million assessment per reactor. Public Service of Colorado could cover 17 reactor assessments. Northern States Power and Commonwealth Edison are characterized by even stronger cash flow positions.

Implications for Public and Cooperative Systems

Federal, public non-Federal, and cooperative system involvement in nuclear power generation also must be considered since their reactors in operation would be subject to retrospective premium assessments. WASH-1139-74 notes potential

TABLE 9

SENSITIVITY OF FINANCIAL DATA TO ASSESSMENTS FOR MULTIPLE REACTORS

1975 Annual Report Data ($ millions)	Duquesne Light	Public Service Co. of Colorado	Northern States Power	Commonwealth Edison
$3 Million Per Reactor				
Impact Per Reactor on E.P.S.	-$.08	-$.10	-$.06	-$.03
Number of Reactors Covered	27.7	21.1	45.4	95.7
Impact Per Reactor on Interest Coverage	-.04x	-.06x	-.03x	-.02x
Number of Reactors Covered	61.0	42.5	79.7	119.5
Impact Per Reactor on Return on Equity	-.42%	-.55%	-.27%	-.11%
Number of Reactors Covered	27.7	21.1	45.4	95.7
Impact Per Reactor on Net Cash Flow ($ millions)	-$2.05	-$2.20	-$1.68	-$1.75
Number of Reactors Covered	20.7	28.6	79.7	172.1
$ 5 Million Per Reactor				
Impact Per Reactor on E.P.S.	-$.14	-$.17	-$.11	-$.05
Number of Reactors Covered	17.4	12.7	27.4	57.6
Impact Per Reactor on Interest Coverage	-.07x	-.10x	-.04x	-.02x
Number of Reactors Covered	35.8	25.5	56.0	125.0
Impact Per Reactor on Return on Equity	-.71%	-.91%	-.45%	-.18%
Number of Reactors Covered	17.4	12.7	27.4	57.6
Impact Per Reactor on Net Cash Flow ($ millions)	-$3.42	-$3.66	-$2.80	-$2.92
Number of Reactors Covered	12.4	17.2	47.8	103.1

Source: 1975 Annual Reports

involvement at the Federal level in terms of the Tennessee Valley Authority's plans for 13 nuclear reactors. The TVA has revenues in excess of $750 million and net income well in excess of $100 million annually suggesting that there should be little problem in meeting any assessments. Since 1959, legislation has permitted the TVA to sell bonds and other debt instruments in the private capital markets. This, coupled with the fact that the majority of TVA's capitalization is in the form of U.S. Treasury appropriation, provides added reason to believe that retrospective premium assessments could be easily handled.[19]

Public non-Federal electric systems are generally referred to as municipal utilities. The largest, the Los Angeles Department of Water and Power, has plans for involvement in four nuclear reactors. Its revenues are in excess of $300 million and net income is over $50 million annually (making it somewhat comparable in size to Duquesne Light). Depreciation and amortization amounts to some $40 million, while the "allowance for funds used during construction" is roughly $15 million. Thus, cash flows should be adequate to meet retrospective premium assessments.[20]

Other public non-Federal systems that have planned involvement with nuclear reactors include: Nebraska Public Power District, Omaha Public Power District, Power Authority of the State of New York, Sacramento Municipal Utility District, and the Washington Public Power Supply System. Although smaller in size than the Los Angeles system, they seem capable of being able to handle likely assessments on the basis of their cash flows. Furthermore, the ability of municipal systems to issue revenue bonds would provide an added cushion for meeting assessments.

---

[19] Federal Power Commission, The 1970 National Power Survey, Part I, (Washington: U.S. Government Printing Office, December 1971), p. I-20-9.

[20] These data and the data underlying the following comments about other non-Federal systems are based on: Federal Power Commission, Statisitics of Publicly Owned Electric Utilities in the United States (Washington: U.S. Government Printing Office, December 1974).

The ability of cooperative systems to meet retrospective premium assessments is less clear. Each situation (as with the case of smaller municipal systems) would have to be examined separately in order to appraise the capability of meeting obligations. However, to the extent that cooperatives are likely to enter into joint ownership arrangements, the impact of assessments would be lessened. Cooperative system financing arrangements could aid in their meeting assessments. The Rural Electrification Administration was established as a lending agency in 1936. Several billions of dollars in loans to cooperative electric systems currently are outstanding. Additional loans might be made for assessment purposes.

Cooperatives traditionally have found it difficult to compete directly in the private capital markets. As a result, the National Rural Utilities Cooperative Finance Corporation was organized for purposes of raising funds in the capital markets.[21] This financing source provides additional reason to believe that cooperative systems would be able to comply with assessment obligations.

V. AVAILABILITY OF CASH FUNDS TO MEET ASSESSMENT OBLIGATIONS

The success or workability of the retrospective premium assessment program is dependent upon the likelihood that the retrospective premium would be available when needed. That is, the establishment of the second tier of "joint" or "pooled" protection against liability claims stemming from nuclear incidents will be of value only if cash fund obligations can be met. Consequently, it would be desirable to provide some form of assurance that electric utilities would not default on retrospective premium obligations.

The traditional concept of insurance is, of course, designed to provide for such assurance. For example, electric utilities currently pay annual insurance premiums to obtain the \$125 million first tier coverage that is provided by the NELIA and MAELU private insurance pools. Presumably, these insurance pools would have the \$125 million readily available in the event of a nuclear disaster. Assurance is, however, largely dependent upon prudent management and regulation of the insurance companies. Even so, a remote chance of default may exist.

[1] *Ibid.*, p. I-20-11.

The second tier retrospective premium program is potentially much riskier in the actual premiums are not paid unless a nuclear disaster amounting to more than $125 million in claims actually occurs. For example, there is no assurance that assessment obligations will be met even if electric utilities acknowledge the possibility of such obligations through balance sheet footnotes to retained earnings or the appropriation of some portion of retained earnings for possible loss contingencies. Neither of these methods provide for the actual setting aside of funds such that they would be available in the event the need arises.

On the other hand, as was noted earlier, utilities could set aside cash and/or marketable securities to meet possible retrospective premium assessments. This could be accomplished by segregating liquid assets on the balance sheet or by footnoting appropriate liquid asset accounts and thereby showing segregation of funds. This, of course, involves setting aside funds out of operating cash flows. How regulatory commissions would react to this approach remains to be seen. For example, receptive commissions might permit utilities to earn somewhat higher "allowable rates of return" such that these "additional" funds could be segregated for purposes of meeting assessments. Such an approach would, however, produce higher rate-payer costs.

In addition to the actual setting aside of funds in the form of liquid assets, other methods can be suggested for guaranteeing that retrospective premiums would be available when needed. In a classic sense, the payment of retrospective premiums might be guaranteed through insurance policies. However, the private nuclear insurance pools already are committed to $125 million in coverage in the event of a nuclear incident and it is unlikely that they would be willing or able to make further commitments.

The use of surety bonds involving three parties can provide a guarantee of performance of a contract by the principal. "It is an agreement by the surety to be responsible to the obligee for the obligation or conduct of the principal."[22] A form of surety or contract bond that is often used in conjunction with construction contracts is the "performance bond"

---

[22] John D. Long and Davis W. Gregg, Property and Liability Insurance Handbook (Homewood: Richard D. Irwin, Inc., 1965), p. 829.

which guarantees the performance of a contractor. An attempt to apply surety bond or contract bond concepts to guarantee retrospective premiums might be, however, both difficult and impractical because of the uncertainty as to when or if an assessment is made. Further analysis of the receptiveness of insurance companies or other third parties to this type of approach needs to be conducted.

Another possible source for guaranteeing retrospective premiums could take the form of "standby letters of credit" issued by commerical banks. The Federal Reserve defines standby letters of credit as:

> "....every letter of credit (or similar arrangement however named or designated) which represents an obligation to the beneficiary on the part of the issuer (1) to repay money borrowed by or advanced to or for the account of the account party or (2) to make payment on account of any evidence of indebtedness undertaken by the account party, or (3) to make payment on account of any default by the account party in the performance of an obligation...."[23]

Guaranteeing retrospective premiums would seem to be possible in conjunction with item three in the above discussion. However, commercial banks have traditionally been interested in short-term commitments or at most term loan length commitments. There is no precedent for this type of guarantee by commercial banks through the use of standby letters of credit. On the other hand, it is possible that some commercial banks might be willing to enter into standby letters of credit for a few years with re-appraisal or renewal decisions being made on a periodic basis.

VI. SUMMARY AND CONCLUSIONS

The major thrust of this study was the examination of the impact of various retrospective premium assessment policies on electric utility cash flow positions and on financial and accounting data. Evidence suggests that current cash flows for investor-owned electric utilities (entering into nuclear reactor ownership arrangements) seem adequate to meet possible retrospective premium assessments.

The impact of assessments on earnings per share, interest coverage, and return on equity levels also was calculated.

[23] Federal Reserve Bulletin (September, 1974), p. 664.

Such an impact, while marginal for some utilities, might be compounded in the form of changing "risk" attitudes or perceptions. For example, the ability to compete effectively in the capital markets might be hampered in the event of a major nuclear incident. Capital market segmentation might even develop between investor-owned electrics involved with nuclear reactors versus those not involved. However, in an efficient capital markets setting, capital cost differences should be prolonged only to the extent that risk perception changes become permanent. It is more likely that, in the event of a nuclear disaster, the repercussions in the capital markets will be severe but temporary. That is, the investor-owned segment of the electric utility industry is probably capable of "weathering" the impact of retrospective premium assessments.

From the standpoint of Federal systems, specifically the TVA, there should be no problem in meeting assessments. Cash flows to meet possible assessments also seem adequate in terms of the larger municipal systems planning to enter into nuclear reactor ownership arrangements. The cash flow capabilities of smaller municipal systems is more questionable. However, possible assessment responsibilities will be tempered by the fact that smaller municipal systems are also expected to rely heavily on some form of joint ownership of nuclear reactors. Possible backup support for cooperatives could be provided by the Rural Electrification Administration and/or the National Rural Utilities Cooperative Finance Corporation in the event of retrospective premium assessments.

While there does not seem to be an immediate problem, concern must be expressed over whether adequate cash funds would be available in the future to meet assessments. The acknowledgement of the possibility of assessment obligations through balance sheet footnotes to retained earnings or through the appropriation of a portion of retained earnings for possible loss contingencies does not provide any assurance that cash funds would be available if needed. This is, of course, because neither method provides for the actual setting aside of cash. Consequently, some method for guaranteeing assessments, along with a system for monitoring the credit-worthiness of involved electric utilities, is warranted.

The use of standby letters of credit from commerical banks might be the preferred form for establishing assessment guarantees for investor-owned electric utilities. These might be arranged for a several-year period with renewal or re-appraisal occurring periodically thereafter. The Nuclear Regulatory Commission could monitor nuclear reactor-involved investor-owned electric utilities annually. In the event that standby letters of credit guarantees were not available, each utility could be requested to establish its credit-worthiness by showing that it had adequate cash funds available to meet assessment obligations. This might be accomplished by the actual segregation of cash or other liquid assets on a utility's balance sheet for meeting possible assessments.

Public and cooperative systems also could be monitored by the NRC in terms of assessment guarantees and/or credit-worthiness appraisals. Instead of standby letters of credit, municipal systems might be able to establish backing by their state governments. Assessment guarantees for cooperative systems might come from the Rural Electrification Administration and/or the National Rural Utilities Cooperative Finance Corporation. In the event that guarantees are not available, the NRC could require that the involved electric systems show that adequate cash funds are available to meet retrospective premium assessments if and when needed.

In summary, a retrospective premium assessment per reactor in the $4 million to $5 million range would permit the phasing out of Government indemnity by 1985. Necessary cash flows seem available for most of the involved electric systems. However, in order to provide assurance that adequate funds would be available when needed in the future, some form of guarantee and/or monitoring system needs to be established.

Financial Impact of Retrospective Premiums on Utilities

In 1976, Ronald Melicher of the University of Colorado prepared a report, "Financial Implications of Retrospective Premium Assessments on Electric Utilities," which analyzed the impact of retrospective premiums of $3 and $5 million on the financial capacity of representative electric utilities. Melicher's report indicated that a single assessment of $5 million would have caused less than a 10% decline in 1975 cash flows of smaller electric utilities such as Duquesne Light and Public Service of Colorado. A $5 million assessment on large utilities would have even less an effect.

An update of Melicher's analysis indicates that such a relationship continues to hold. In the attached Tables 1 and 2, Melicher's figures have been recomputed using 1978 data from the annual reports of the same four companies that Melicher analyzed -- Duquesne Light, Public Service Company of Colorado, Northern States Power, and Commonwealth Edison. Thus, at $5 million per assessment, the total potential assessment per utility per accident for all of its reactors combined would decrease cash flow by less than 10 percent. For example, if, in 1978, Commonwealth Edison had been assessed $5 million for each of its 6.5 reactors licensed to operate, its net cash flow would have been effectively reduced from $331.6 million to $305.2 million, a reduction of about 8%.

Melicher's analysis has also been extended to test the effect of larger retrospective premium assessments on the finances of the same four representative utilities. The effect of a $20 million assessment on all the reactors on the cash flow of each of the utilities ranges from a 21% reduction for Duquesne Light (from $35.4 million to $28.1 million) to a 32% reduction for Commonwealth Edison (from $331.6 million to $226.1 million). Although for each utility the effect of such an assessment would be substantial, it should not be unmanageable.

Table 3 updates Melicher's analysis a step further. This table provides a sensitivity analysis of the impact of the new retrospective premium levels being discussed. If a $10 million retrospective premium were chosen, 1978 cash flow of the four utilities would cover assessments for 4.6 reactors for Duquesne Light, 7.9 reactors for Public Service of Colorado, 27.6 reactors for Northern States Power, and 40.9 reactors for Commonwealth Edison. This would be more than enough to cover one assessment for all the reactors currently operating or planned by each of the four utilities and, in fact, would cover al least two assessments per reactor.

If a $20 million retrospective premium were chosen, 1978 cash flow of the four utilities would cover assessments for 2.3 reactors for Duquesne Light, 4.0 reactors for Public Service of Colorado, 13.8 reactors for Northern States Power, and 20.5 for Commonwealth Edison. This would cover the assessments from one catastrophic accident, but would not be sufficient in the cases of Commonwealth Edison or Duquesne to cover a second maximum assessment in one year if all their planned facilities have been licensed to operate. Of course this effect would be mitigated by the likelihood that payments on a particular assessment would be phased over several years. On balance, it appears that although a $10 million assessment could be managed by the four representative utilities, a $20 million assessment might be marginal and subject to uncertainty.

Table 1

FINANCIAL IMPACTS OF RETROSPECTIVE PREMIUM ASSESSMENTS

1978 Income Statement Data ($ millions)	Duquesne Light	Public Service Co. of Colorado	Northern States Power	Commonwealth Edison
Total Operating Revenues	$573.1	$729.8	$979.3	$2442.8
Earnings Before Interest & Taxes	151.1	125.1	262.4	657.6
Interest	65.6	41.8	66.6	257.1
Earnings Before Taxes	85.5	83.3	195.8	400.5
Income Taxes	19.8	25.6	80.6	79.5
Net Income	65.7	57.7	115.2	321.0
Preferred Stock Dividends	18.9	13.5	14.5	68.0
Earnings Available to Common Stockholders	46.8	44.2	100.7	253.0
Common Equity ($ millions)	577.8	515.6	778.8	2305.4
1978 Effective Income Tax Rate	23.15%	30.73%	41.2%	19.85%
Number of Shares of Common Stock Outstanding (millions) (avg.)	31.5	26.6	29.7	76.9
Earnings Per Share	$ 1.49	$ 1.66	$ 3.39	$ 3.30
Interest Coverage (net income plus interest)/interest	2.00X	2.38X	2.73X	2.25X
Rate of Return on Common Equity	8.09%	8.57%	12.93%	10.97%
Number of Reactors Currently Licensed to Operate	.475 reactor	1 reactor	3 reactors	6.5 reactors

Aggregate Impact of Retrospective Premiums (i.e., a before tax "expense")	Duquesne Light	Public Service Co. of Colorado	Northern States Power	Commonwealth Edison
$5 Million Assessment (X reactors)				
Earnings Per Share	$ 1.43	$ 1.53	$ 3.09	$ 2.95
Interest Coverage	1.97X	2.30X	2.59X	2.15X
Return on Common Equity	7.78%	7.90%	11.77%	9.83%
$10 Million Assessment (X reactors)				
Earnings Per Share	$ 1.37	$ 1.40	$ 2.78	$ 2.60
Interest Coverage	1.95X	2.21X	2.45X	2.04X
Return on Common Equity	7.46%	7.22%	10.62%	8.68%
$20 Million Assessment (X reactors)				
Earnings Per Share	$ 1.25	$ 1.14	$ 2.18	$ 1.92
Interest Coverage	1.89X	2.05X	2.19X	1.84X
Return on Common Equity	6.83%	5.88%	8.32%	6.39%

Table 2

CASH FLOW IMPACT OF RETROSPECTIVE PREMIUM ASSESSMENTS

1978 Annual Report Data ($ millions)	Duquesne Light	Public Service Co. of Colorado	Northern States Power	Commonwealth Edison
Source of Funds From Operations				
Net Income	$ 65.7	$ 57.7	$115.2	$321.0
Depreciation and Depletion	45.7	53.6	89.2	309.3
Deferred Income Taxes and Investment Tax Credits	18.4	21.8	48.2	118.1
Allowance For Funds Used During Construction	(20.9)	(16.7)	(9.3)	(159.3)
Other				
Total	108.9	116.4	243.3	589.1
Application of Cash Funds				
Preferred Stock Dividends	18.9	13.5	14.5	68.0
Common Stock Dividends	54.6	41.2	63.6	189.5
Total	73.5	61.7	78.1	257.5
Estimate of Net Cash Flow (i.e., sources less applications)	$ 35.4	$ 54.7	$165.2	$331.6
Cash Flow Per Share	$ 1.12	$ 2.06	$ 5.56	$ 4.31
Impact of Retrospective Premiums (i.e., a before tax "expense")				
$5 Million Assessment (X reactors)				
Net Cash Flow ($ millions)	$ 33.6	$ 51.2	$156.2	$305.2
Cash Flow Per Share	$ 1.07	$ 1.92	$ 5.26	$ 3.97
$10 Million Assessment (X reactors)				
Net Cash Flow ($ millions)	$ 31.8	$ 47.8	$147.2	$278.8
Cash Flow Per Share	$ 1.01	$ 1.80	$ 4.96	$ 3.63
$20 Million Assessment (X reactors)				
Net Cash Flow ($ millions)	$ 28.1	$ 40.9	$129.3	$226.1
Cash Flow Per Share	$ 0.89	$ 1.54	$ 4.35	$ 2.94

Table 3

SENSITIVITY OF FINANCIAL DATA TO ASSESSMENTS FOR MULTIPLE REACTORS

1978 Annual Report Data ($ millions)	Duquesne Light	Public Service Co. of Colorado	Northern States Power	Commonwealth Edison
$5 Million Per Reactor				
Impact Per Reactor on E.P.S.	$-0.12	$-0.13	$-0.10	$-0.05
Number of Reactors Covered	12.4	12.8	33.9	62.3
Impact Per Reactor on Return on Equity	-0.66%	-0.67%	-0.38%	-0.18%
Number of Reactors Covered	12.3	12.8	34.0	60.9
Impact Per Reactor on Net Cash Flow ($ millions)	$-3.8	$-3.5	$-3.0	$-4.1
Number of Reactors Covered	9.3	15.6	55.1	80.9
$10 Million Per Reactor				
Impact Per Reactor on E.P.S.	$-0.24	$-0.26	$-0.20	$-0.11
Number of Reactors Covered	6.2	6.4	17.0	31.1
Impact Per Reactor on Return on Equity	-1.33%	-1.35%	-0.77%	-0.35%
Number of Reactors Covered	6.1	6.4	17.0	30.5
Impact Per Reactor on Net Cash Flow ($ millions)	$-7.7	$-6.9	$-6.0	$-8.1
Number of Reactors Covered	4.6	7.9	27.6	40.9
$20 Million Per Reactor				
Impact Per Reactor on E.P.S.	$-0.48	$-0.52	$-0.40	$-0.22
Number of Reactors Covered	3.1	3.2	8.5	15.6
Impact Per Reactor on Return on Equity	-2.66%	-2.69%	-1.54%	-0.70%
Number of Reactors Covered	3.0	3.2	8.5	15.3
Impact Per Reactor on Net Cash Flow ($ millions)	$15.4	$ 13.8	$ 9.0	$16.2
Number of Reactors Covered	2.3	4.0	13.8	20.5

PDR

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

CHAIRMAN

COMMISSION CORRESPONDENCE

December 31, 1980

RECEIVED JAN 2 1981 U.S. NUCLEAR REGULATORY COMMISSION

The Honorable Abraham Ribicoff, Chairman
Committee on Governmental Affairs
United States Senate
Washington, D. C. 20510

Dear Mr. Chairman:

The August 18, 1980 GAO report entitled "Analysis of the Price-Anderson Act" (EMD-80-80) recommends that the Nuclear Regulatory Commission undertake technical studies to assist Congress in determining a realistic limitation on liability for nuclear accidents.

There are probabilistic risk analysis models which can be used to calculate the off-site consequences in the event of a nuclear plant accident. The Calculations of Reactor Accident Consequences (CRAC) code, from the 1975 Reactor Safety Study (WASH-1400), is used by the NRC staff to calculate reactor accident consequences, including early fatalities, early illnesses, latent cancers, and property damage. This code has been improved in some respects since 1975 and is continually being revised to incorporate improvements. For example, several computer codes, including CRAC, will be revised to reflect the lessons learned from the Three Mile Island accident and to incorporate recent research results. For a recent study, NUREG-0715, "Task Force Report on Interim Operation of Indian Point" (copy attached), the CRAC code was used to make risk comparisons of various reactor sites, reactor designs, and public protective measures.

In that comparison, off-site risks for six different reactor sites were estimated (see NUREG-0715, p. 17). The sites considered ranged from the Indian Point site, located in the most densely populated area, to the Diablo Canyon site, which is quite remote. The property damage estimates indicate that any accident which is serious enough to require evacuation of members of the general public is likely to cost \$10 to \$100 million. Accidents of this type have a calculated probability of about one in ten thousand per reactor year.

For lower probability accidents, the numbers are larger. As you know, these probabilistic estimates have wide ranges, depending on protective measures, design, sites, and uncertainties in the estimates (see NUREG-0715, p. 39). Thus for a probability of 10^{-6} per reactor year,

D-re
8101130620
3pp

the estimates for early fatalities range from none to 5,000. For a probability of 10^{-9}, estimates of early fatalities range from 700 to 50,000. Similarly the estimates for early illness range from 10 to 10,000 for a probability of 7×10^{-7} per reactor year and from 6,000 to 800,000 for a probability of 10^{-9}. Latent cancer estimates range from none to 200 for a 10^{-6} probability and from 200 to 2,000 for a 10^{-9} probability. Property damage estimates range from \$2 million to \$2 billion for a probability of 10^{-6} per reactor year, and from \$8 billion to \$100 billion for a probability of 10^{-9} (in 1974 dollars). We have not estimated the monetary costs associated with early fatalities, early illnesses or latent cancers.

In addition to the substantial uncertainties inherent in this type of calculation, there is a suspected bias in the model for the property damage analyses which the staff believes tends to underestimate the potential costs. The model uses criteria for interdicting the use of contaminated property and assumptions for cleanup of contaminated property which may be optimistic with respect to costs.

The GAO report recommends that the Commission realistically define a limit of liability for the Price-Anderson Act. As the Acting Executive Director for Operations stated in his letter to GAO commenting on the draft report, since a decision to increase the liability limit must be made by Congress and not the Commission, the Commission believes it may be more appropriate for Congress to determine whether to increase the liability limit based on full consideration of the types of consequences which may occur following an accident (i.e., early fatalities, early illnesses, latent cancer, and property damage). However, the Commission believes that the statutorily prescribed limits of liability should be adjusted to account for inflation.

The GAO report also recommends that the Commission reassess the Federal government indemnity. The Commission believes that there is no objective source of information available to reassess this indemnity and that this is an area for the exercise of Congressional judgment.

Finally, in response to the recommendation that the Commission reassess the financial impact of increasing the present \$5 million retrospective premium, I have attached a copy of a financial impact study completed by the staff last year which updates earlier information contained in a 1976 report prepared for the Commission by Dr. Ronald Melicher of the University of Colorado, NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities" (copy enclosed). This report assessed the financial impact of various retrospective premiums on representative utilities. The staff study provides additional information in this area as well as a sensitivity analysis of the impact of increasing the retrospective premium to \$20 million per reactor. This type of

review should be required for Congress in assessing the tradeoff between the costs of requiring additional protection through increased premiums and the costs of providing power. We do not present this study as definitive, since we are not experts in the financial management of utilities.

Sincerely,

John F. Ahearne

John F. Ahearne

Enclosures:
1. NUREG-0715, "Task Force Report on Interim Operation of Indian Point"
2. NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities"
3. Financial Impact Study

cc: Sen. Charles H. Percy

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

CHAIRMAN

December 31, 1980

The Honorable Jack Brooks, Chairman
Committee on Government Operations
United States House of Representatives
Washington, D. C. 20515

Dear Mr. Chairman:

The August 18, 1980 GAO report entitled "Analysis of the Price-Anderson Act" (EMD-80-80) recommends that the Nuclear Regulatory Commission undertake technical studies to assist Congress in determining a realistic limitation on liability for nuclear accidents.

There are probabilistic risk analysis models which can be used to calculate the off-site consequences in the event of a nuclear plant accident. The Calculations of Reactor Accident Consequences (CRAC) code, from the 1975 Reactor Safety Study (WASH-1400), is used by the NRC staff to calculate reactor accident consequences, including early fatalities, early illnesses, latent cancers, and property damage. This code has been improved in some respects since 1975 and is continually being revised to incorporate improvements. For example, several computer codes, including CRAC, will be revised to reflect the lessons learned from the Three Mile Island accident and to incorporate recent research results. For a recent study, NUREG-0715, "Task Force Report on Interim Operation of Indian Point" (copy attached), the CRAC code was used to make risk comparisons of various reactor sites, reactor designs, and public protective measures.

In that comparison, off-site risks for six different reactor sites were estimated (see NUREG-0715, p. 17). The sites considered ranged from the Indian Point site, located in the most densely populated area, to the Diablo Canyon site, which is quite remote. The property damage estimates indicate that any accident which is serious enough to require evacuation of members of the general public is likely to cost \$10 to \$100 million. Accidents of this type have a calculated probability of about one in ten thousand per reactor year.

For lower probability accidents, the numbers are larger. As you know, these probabilistic estimates have wide ranges, depending on protective measures, design, sites, and uncertainties in the estimates (see NUREG-0715, p. 39). Thus for a probability of 10^{-6} per reactor year,

P-R
8101130622
3pp

the estimates for early fatalities range from none to 5,000. For a probability of 10^{-9}, estimates of early fatalities range from 700 to 50,000. Similarly the estimates for early illness range from 10 to 10,000 for a probability of 7×10^{-7} per reactor year and from 6,000 to 800,000 for a probability of 10^{-9}. Latent cancer estimates range from none to 200 for a 10^{-6} probability and from 200 to 2,000 for a 10^{-9} probability. Property damage estimates range from \$2 million to \$2 billion for a probability of 10^{-6} per reactor year, and from \$8 billion to \$100 billion for a probability of 10^{-9} (in 1974 dollars). We have not estimated the monetary costs associated with early fatalities, early illnesses or latent cancers.

In addition to the substantial uncertainties inherent in this type of calculation, there is a suspected bias in the model for the property damage analyses which the staff believes tends to underestimate the potential costs. The model uses criteria for interdicting the use of contaminated property and assumptions for cleanup of contaminated property which may be optimistic with respect to costs.

The GAO report recommends that the Commission realistically define a limit of liability for the Price-Anderson Act. As the Acting Executive Director for Operations stated in his letter to GAO commenting on the draft report, since a decision to increase the liability limit must be made by Congress and not the Commission, the Commission believes it may be more appropriate for Congress to determine whether to increase the liability limit based on full consideration of the types of consequences which may occur following an accident (i.e., early fatalities, early illnesses, latent cancer, and property damage). However, the Commission believes that the statutorily prescribed limits of liability should be adjusted to account for inflation.

The GAO report also recommends that the Commission reassess the Federal government indemnity. The Commission believes that there is no objective source of information available to reassess this indemnity and that this is an area for the exercise of Congressional judgment.

Finally, in response to the recommendation that the Commission reassess the financial impact of increasing the present \$5 million retrospective premium, I have attached a copy of a financial impact study completed by the staff last year which updates earlier information contained in a 1976 report prepared for the Commission by Dr. Ronald Melicher of the University of Colorado, NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities" (copy enclosed). This report assessed the financial impact of various retrospective premiums on representative utilities. The staff study provides additional information in this area as well as a sensitivity analysis of the impact of increasing the retrospective premium to \$20 million per reactor. This type of

review should be required for Congress in assessing the tradeoff between the costs of requiring additional protection through increased premiums and the costs of providing power. We do not present this study as definitive, since we are not experts in the financial management of utilities.

Sincerely,

John F. Ahearne

Enclosures:
1. NUREG-0715, "Task Force Report on Interim Operation of Indian Point"
2. NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities"
3. Financial Impact Study

cc. Rep. Frank Horton

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

CHAIRMAN

December 31, 1980

The Honorable Gary Hart, Chairman
Subcommittee on Nuclear Regulation
Committee on Environment and Public Works
United States Senate
Washington, D. C. 20510

Dear Mr. Chairman:

The August 18, 1980 GAO report entitled "Analysis of the Price-Anderson Act" (EMD-80-80) recommends that the Nuclear Regulatory Commission undertake technical studies to assist Congress in determining a realistic limitation on liability for nuclear accidents.

There are probabilistic risk analysis models which can be used to calculate the off-site consequences in the event of a nuclear plant accident. The Calculations of Reactor Accident Consequences (CRAC) code, from the 1975 Reactor Safety Study (WASH-1400), is used by the NRC staff to calculate reactor accident consequences, including early fatalities, early illnesses, latent cancers, and property damage. This code has been improved in some respects since 1975 and is continually being revised to incorporate improvements. For example, several computer codes, including CRAC, will be revised to reflect the lessons learned from the Three Mile Island accident and to incorporate recent research results. For a recent study, NUREG-0715, "Task Force Report on Interim Operation of Indian Point" (copy attached), the CRAC code was used to make risk comparisons of various reactor sites, reactor designs, and public protective measures.

In that comparison, off-site risks for six different reactor sites were estimated (see NUREG-0715, p. 17). The sites considered ranged from the Indian Point site, located in the most densely populated area, to the Diablo Canyon site, which is quite remote. The property damage estimates indicate that any accident which is serious enough to require evacuation of members of the general public is likely to cost \$10 to \$100 million. Accidents of this type have a calculated probability of about one in ten thousand per reactor year.

For lower probability accidents, the numbers are larger. As you know, these probabilistic estimates have wide ranges, depending on protective measures, design, sites, and uncertainties in the estimates (see NUREG-0715, p. 39). Thus for a probability of 10^{-6} per reactor year,

Dupe
8101130632
399

the estimates for early fatalities range from none to 5,000. For a probability of 10^{-9}, estimates of early fatalities range from 700 to 50,000. Similarly the estimates for early illness range from 10 to 10,000 for a probability of 7×10^{-7} per reactor year and from 6,000 to 800,000 for a probability of 10^{-9}. Latent cancer estimates range from none to 200 for a 10^{-6} probability and from 200 to 2,000 for a 10^{-9} probability. Property damage estimates range from $2 million to $2 billion for a probability of 10^{-6} per reactor year, and from $8 billion to $100 billion for a probability of 10^{-9} (in 1974 dollars). We have not estimated the monetary costs associated with early fatalities, early illnesses or latent cancers.

In addition to the substantial uncertainties inherent in this type of calculation, there is a suspected bias in the model for the property damage analyses which the staff believes tends to underestimate the potential costs. The model uses criteria for interdicting the use of contaminated property and assumptions for cleanup of contaminated property which may be optimistic with respect to costs.

The GAO report recommends that the Commission realistically define a limit of liability for the Price-Anderson Act. As the Acting Executive Director for Operations stated in his letter to GAO commenting on the draft report, since a decision to increase the liability limit must be made by Congress and not the Commission, the Commission believes it may be more appropriate for Congress to determine whether to increase the liability limit based on full consideration of the types of consequences which may occur following an accident (i.e., early fatalities, early illnesses, latent cancer, and property damage). However, the Commission believes that the statutorily prescribed limits of liability should be adjusted to account for inflation.

The GAO report also recommends that the Commission reassess the Federal government indemnity. The Commission believes that there is no objective source of information available to reassess this indemnity and that this is an area for the exercise of Congressional judgment.

Finally, in response to the recommendation that the Commission reassess the financial impact of increasing the present $5 million retrospective premium, I have attached a copy of a financial impact study completed by the staff last year which updates earlier information contained in a 1976 report prepared for the Commission by Dr. Ronald Melicher of the University of Colorado, NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities" (copy enclosed). This report assessed the financial impact of various retrospective premiums on representative utilities. The staff study provides additional information in this area as well as a sensitivity analysis of the impact of increasing the retrospective premium to $20 million per reactor. This type of

review should be required for Congress in assessing the tradeoff between the costs of requiring additional protection through increased premiums and the costs of providing power. We do not present this study as definitive, since we are not experts in the financial management of utilities.

Sincerely,

John F. Ahearne

John F. Ahearne

Enclosures:
1. NUREG-0715, "Task Force Report on Interim Operation of Indian Point"
2. NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities"
3. Financial Impact Study

cc: Sen. Alan Simpson

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

CHAIRMAN

December 31, 1980

The Honorable Morris K. Udall, Chairman
Subcommittee on Energy and the Environment
Committee on Interior and Insular Affairs
United States House of Representatives
Washington, D. C. 20515

Dear Mr. Chairman:

The August 18, 1980 GAO report entitled "Analysis of the Price-Anderson Act" (EMD-80-80) recommends that the Nuclear Regulatory Commission undertake technical studies to assist Congress in determining a realistic limitation on liability for nuclear accidents.

There are probabilistic risk analysis models which can be used to calculate the off-site consequences in the event of a nuclear plant accident. The Calculations of Reactor Accident Consequences (CRAC) code, from the 1975 Reactor Safety Study (WASH-1400), is used by the NRC staff to calculate reactor accident consequences, including early fatalities, early illnesses, latent cancers, and property damage. This code has been improved in some respects since 1975 and is continually being revised to incorporate improvements. For example, several computer codes, including CRAC, will be revised to reflect the lessons learned from the Three Mile Island accident and to incorporate recent research results. For a recent study, NUREG-0715, "Task Force Report on Interim Operation of Indian Point" (copy attached), the CRAC code was used to make risk comparisons of various reactor sites, reactor designs, and public protective measures.

In that comparison, off-site risks for six different reactor sites were estimated (see NUREG-0715, p. 17). The sites considered ranged from the Indian Point site, located in the most densely populated area, to the Diablo Canyon site, which is quite remote. The property damage estimates indicate that any accident which is serious enough to require evacuation of members of the general public is likely to cost \$10 to \$100 million. Accidents of this type have a calculated probability of about one in ten thousand per reactor year.

For lower probability accidents, the numbers are larger. As you know, these probabilistic estimates have wide ranges, depending on protective measures, design, sites, and uncertainties in the estimates (see NUREG-0715, p. 39). Thus for a probability of 10-6 per reactor year,

D/R
8101130634
3pp

the estimates for early fatalities range from none to 5,000. For a probability of 10^{-9}, estimates of early fatalities range from 700 to 50,000. Similarly the estimates for early illness range from 10 to 10,000 for a probability of 7×10^{-7} per reactor year and from 6,000 to 800,000 for a probability of 10^{-9}. Latent cancer estimates range from none to 200 for a 10^{-6} probability and from 200 to 2,000 for a 10^{-9} probability. Property damage estimates range from $2 million to $2 billion for a probability of 10^{-6} per reactor year, and from $8 billion to $100 billion for a probability of 10^{-9} (in 1974 dollars). We have not estimated the monetary costs associated with early fatalities, early illnesses or latent cancers.

In addition to the substantial uncertainties inherent in this type of calculation, there is a suspected bias in the model for the property damage analyses which the staff believes tends to underestimate the potential costs. The model uses criteria for interdicting the use of contaminated property and assumptions for cleanup of contaminated property which may be optimistic with respect to costs.

The GAO report recommends that the Commission realistically define a limit of liability for the Price-Anderson Act. As the Acting Executive Director for Operations stated in his letter to GAO commenting on the draft report, since a decision to increase the liability limit must be made by Congress and not the Commission, the Commission believes it may be more appropriate for Congress to determine whether to increase the liability limit based on full consideration of the types of consequences which may occur following an accident (i.e., early fatalities, early illnesses, latent cancer, and property damage). However, the Commission believes that the statutorily prescribed limits of liability should be adjusted to account for inflation.

The GAO report also recommends that the Commission reassess the Federal government indemnity. The Commission believes that there is no objective source of information available to reassess this indemnity and that this is an area for the exercise of Congressional judgment.

Finally, in response to the recommendation that the Commission reassess the financial impact of increasing the present $5 million retrospective premium, I have attached a copy of a financial impact study completed by the staff last year which updates earlier information contained in a 1976 report prepared for the Commission by Dr. Ronald Melicher of the University of Colorado, NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities" (copy enclosed). This report assessed the financial impact of various retrospective premiums on representative utilities. The staff study provides additional information in this area as well as a sensitivity analysis of the impact of increasing the retrospective premium to $20 million per reactor. This type of

review should be required for Congress in assessing the tradeoff between the costs of requiring additional protection through increased premiums and the costs of providing power. We do not present this study as definitive, since we are not experts in the financial management of utilities.

Sincerely,

John F. Ahearne

John F. Ahearne

Enclosures:
1. NUREG-0715, "Task Force Report on Interim Operation of Indian Point"
2. NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities"
3. Financial Impact Study

cc: Rep. Steven Symms

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

CHAIRMAN

December 31, 1980

The Honorable Toby Moffett, Chairman
Subcommittee on Environment, Energy and
Natural Resources
Committee on Government Operations
United States House of Representatives
Washington, D. C. 20515

Dear Mr. Chairman:

The August 18, 1980 GAO report entitled "Analysis of the Price-Anderson Act" (EMD-80-80) recommends that the Nuclear Regulatory Commission undertake technical studies to assist Congress in determining a realistic limitation on liability for nuclear accidents.

There are probabilistic risk analysis models which can be used to calculate the off-site consequences in the event of a nuclear plant accident. The Calculations of Reactor Accident Consequences (CRAC) code, from the 1975 Reactor Safety Study (WASH-1400), is used by the NRC staff to calculate reactor accident consequences, including early fatalities, early illnesses, latent cancers, and property damage. This code has been improved in some respects since 1975 and is continually being revised to incorporate improvements. For example, several computer codes, including CRAC, will be revised to reflect the lessons learned from the Three Mile Island accident and to incorporate recent research results. For a recent study, NUREG-0715, "Task Force Report on Interim Operation of Indian Point" (copy attached), the CRAC code was used to make risk comparisons of various reactor sites, reactor designs, and public protective measures.

In that comparison, off-site risks for six different reactor sites were estimated (see NUREG-0715, p. 17). The sites considered ranged from the Indian Point site, located in the most densely populated area, to the Diablo Canyon site, which is quite remote. The property damage estimates indicate that any accident which is serious enough to require evacuation of members of the general public is likely to cost \$10 to \$100 million. Accidents of this type have a calculated probability of about one in ten thousand per reactor year.

For lower probability accidents, the numbers are larger. As you know, these probabilistic estimates have wide ranges, depending on protective measures, design, sites, and uncertainties in the estimates (see NUREG-0715, p. 39). Thus for a probability of 10^{-6} per reactor year,

DUR
8101130637
3 pp

the estimates for early fatalities range from none to 5,000. For a probability of 10^{-9}, estimates of early fatalities range from 700 to 50,000. Similarly the estimates for early illness range from 10 to 10,000 for a probability of 7×10^{-7} per reactor year and from 6,000 to 800,000 for a probability of 10^{-9}. Latent cancer estimates range from none to 200 for a 10^{-6} probability and from 200 to 2,000 for a 10^{-9} probability. Property damage estimates range from \$2 million to \$2 billion for a probability of 10^{-6} per reactor year, and from \$8 billion to \$100 billion for a probability of 10^{-9} (in 1974 dollars). We have not estimated the monetary costs associated with early fatalities, early illnesses or latent cancers.

In addition to the substantial uncertainties inherent in this type of calculation, there is a suspected bias in the model for the property damage analyses which the staff believes tends to underestimate the potential costs. The model uses criteria for interdicting the use of contaminated property and assumptions for cleanup of contaminated property which may be optimistic with respect to costs.

The GAO report recommends that the Commission realistically define a limit of liability for the Price-Anderson Act. As the Acting Executive Director for Operations stated in his letter to GAO commenting on the draft report, since a decision to increase the liability limit must be made by Congress and not the Commission, the Commission believes it may be more appropriate for Congress to determine whether to increase the liability limit based on full consideration of the types of consequences which may occur following an accident (i.e., early fatalities, early illnesses, latent cancer, and property damage). However, the Commission believes that the statutorily prescribed limits of liability should be adjusted to account for inflation.

The GAO report also recommends that the Commission reassess the Federal government indemnity. The Commission believes that there is no objective source of information available to reassess this indemnity and that this is an area for the exercise of Congressional judgment.

Finally, in response to the recommendation that the Commission reassess the financial impact of increasing the present \$5 million retrospective premium, I have attached a copy of a financial impact study completed by the staff last year which updates earlier information contained in a 1976 report prepared for the Commission by Dr. Ronald Melicher of the University of Colorado, NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities" (copy enclosed). This report assessed the financial impact of various retrospective premiums on representative utilities. The staff study provides additional information in this area as well as a sensitivity analysis of the impact of increasing the retrospective premium to \$20 million per reactor. This type of

review should be required for Congress in assessing the tradeoff between the costs of requiring additional protection through increased premiums and the costs of providing power. We do not present this study as definitive, since we are not experts in the financial management of utilities.

Sincerely,

John F. Ahearne

Enclosures:
1. NUREG-0715, "Task Force Report on Interim Operation of Indian Point"
2. NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities"
3. Financial Impact Study

cc: Rep. Paul N. McCloskey, Jr.

CHAIRMAN

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

December 31, 1980

The Honorable John D. Dingell, Chairman
Subcommittee on Energy and Power
Committee on Interstate and Foreign Commerce
United States House of Representatives
Washington, D. C. 20515

Dear Mr. Chairman:

The August 18, 1980 GAO report entitled "Analysis of the Price-Anderson Act" (EMD-80-80) recommends that the Nuclear Regulatory Commission undertake technical studies to assist Congress in determining a realistic limitation on liability for nuclear accidents.

There are probabilistic risk analysis models which can be used to calculate the off-site consequences in the event of a nuclear plant accident. The Calculations of Reactor Accident Consequences (CRAC) code, from the 1975 Reactor Safety Study (WASH-1400), is used by the NRC staff to calculate reactor accident consequences, including early fatalities, early illnesses, latent cancers, and property damage. This code has been improved in some respects since 1975 and is continually being revised to incorporate improvements. For example, several computer codes, including CRAC, will be revised to reflect the lessons learned from the Three Mile Island accident and to incorporate recent research results. For a recent study, NUREG-0715, "Task Force Report on Interim Operation of Indian Point" (copy attached), the CRAC code was used to make risk comparisons of various reactor sites, reactor designs, and public protective measures.

In that comparison, off-site risks for six different reactor sites were estimated (see NUREG-0715, p. 17). The sites considered ranged from the Indian Point site, located in the most densely populated area, to the Diablo Canyon site, which is quite remote. The property damage estimates indicate that any accident which is serious enough to require evacuation of members of the general public is likely to cost \$10 to \$100 million. Accidents of this type have a calculated probability of about one in ten thousand per reactor year.

For lower probability accidents, the numbers are larger. As you know, these probabilistic estimates have wide ranges, depending on protective measures, design, sites, and uncertainties in the estimates (see NUREG-0715, p. 39). Thus for a probability of 10^{-6} per reactor year,

D-re
8101130640
7 pp

the estimates for early fatalities range from none to 5,000. For a probability of 10^{-9}, estimates of early fatalities range from 700 to 50,000. Similarly the estimates for early illness range from 10 to 10,000 for a probability of 7 X 10^{-7} per reactor year and from 6,000 to 800,000 for a probability of 10^{-9}. Latent cancer estimates range from none to 200 for a 10^{-6} probability and from 200 to 2,000 for a 10^{-9} probability. Property damage estimates range from \$2 million to \$2 billion for a probability of 10^{-6} per reactor year, and from \$8 billion to \$100 billion for a probability of 10^{-9} (in 1974 dollars). We have not estimated the monetary costs associated with early fatalities, early illnesses or latent cancers.

In addition to the substantial uncertainties inherent in this type of calculation, there is a suspected bias in the model for the property damage analyses which the staff believes tends to underestimate the potential costs. The model uses criteria for interdicting the use of contaminated property and assumptions for cleanup of contaminated property which may be optimistic with respect to costs.

The GAO report recommends that the Commission realistically define a limit of liability for the Price-Anderson Act. As the Acting Executive Director for Operations stated in his letter to GAO commenting on the draft report, since a decision to increase the liability limit must be made by Congress and not the Commission, the Commission believes it may be more appropriate for Congress to determine whether to increase the liability limit based on full consideration of the types of consequences which may occur following an accident (i.e., early fatalities, early illnesses, latent cancer, and property damage). However, the Commission believes that the statutorily prescribed limits of liability should be adjusted to account for inflation.

The GAO report also recommends that the Commission reassess the Federal government indemnity. The Commission believes that there is no objective source of information available to reassess this indemnity and that this is an area for the exercise of Congressional judgment.

Finally, in response to the recommendation that the Commission reassess the financial impact of increasing the present \$5 million retrospective premium, I have attached a copy of a financial impact study completed by the staff last year which updates earlier information contained in a 1976 report prepared for the Commission by Dr. Ronald Melicher of the University of Colorado, NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities" (copy enclosed). This report assessed the financial impact of various retrospective premiums on representative utilities. The staff study provides additional information in this area as well as a sensitivity analysis of the impact of increasing the retrospective premium to \$20 million per reactor. This type of

review should [illegible] required for Congress in assessing the tradeoff between the costs of requiring additional protection through increased premiums and the costs of providing power. We do not present this study as definitive, since we are not experts in the financial management of utilities.

Sincerely,

John F. Ahearne

John F. Ahearne

Enclosures:
1. NUREG-0715, "Task Force Report on Interim Operation of Indian Point"
2. NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities"
3. Financial Impact Study

cc: Rep. Clarence J. Brown

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

CHAIRMAN

December 31, 1980

Mr. Elmer B. Staats
Comptroller General
U.S. General Accounting Office
441 G Street, N.W.
Washington, D. C. 20548

Dear Mr. Staats:

The August 18, 1980 GAO report entitled "Analysis of the Price-Anderson Act" (EMD-80-80) recommends that the Nuclear Regulatory Commission undertake technical studies to assist Congress in determining a realistic limitation on liability for nuclear accidents.

There are probabilistic risk analysis models which can be used to calculate the off-site consequences in the event of a nuclear plant accident. The Calculations of Reactor Accident Consequences (CRAC) code, from the 1975 Reactor Safety Study (WASH-1400), is used by the NRC staff to calculate reactor accident consequences, including early fatalities, early illnesses, latent cancers, and property damage. This code has been improved in some respects since 1975 and is continually being revised to incorporate improvements. For example, several computer codes, including CRAC, will be revised to reflect the lessons learned from the Three Mile Island accident and to incorporate recent research results. For a recent study, NUREG-0715, "Task Force Report on Interim Operation of Indian Point" (copy attached), the CRAC code was used to make risk comparisons of various reactor sites, reactor designs, and public protective measures.

In that comparison, off-site risks for six different reactor sites were estimated (see NUREG-0715, p. 17). The sites considered ranged from the Indian Point site, located in the most densely populated area, to the Diablo Canyon site, which is quite remote. The property damage estimates indicate that any accident which is serious enough to require evacuation of members of the general public is likely to cost \$10 to \$100 million. Accidents of this type have a calculated probability of about one in ten thousand per reactor year.

For lower probability accidents, the numbers are larger. As you know, these probabilistic estimates have wide ranges, depending on protective measures, design, sites, and uncertainties in the estimates (see NUREG-0715, p. 39). Thus for a probability of 10^{-6} per reactor year,

D-pe
8101130643
3pp

the estimates for early fatalities range from none to 5,000. For a probability of 10^{-9}, estimates of early fatalities range from 700 to 50,000. Similarly the estimates for early illness range from 10 to 10,000 for a probability of 7×10^{-7} per reactor year and from 6,000 to 800,000 for a probability of 10^{-9}. Latent cancer estimates range from none to 200 for a 10^{-6} probability and from 200 to 2,000 for a 10^{-9} probability. Property damage estimates range from $2 million to $2 billion for a probability of 10^{-6} per reactor year, and from $8 billion to $100 billion for a probability of 10^{-9} (in 1974 dollars). We have not estimated the monetary costs associated with early fatalities, early illnesses or latent cancers.

In addition to the substantial uncertainties inherent in this type of calculation, there is a suspected bias in the model for the property damage analyses which the staff believes tends to underestimate the potential costs. The model uses criteria for interdicting the use of contaminated property and assumptions for cleanup of contaminated property which may be optimistic with respect to costs.

The GAO report recommends that the Commission realistically define a limit of liability for the Price-Anderson Act. As the Acting Executive Director for Operations stated in his letter to GAO commenting on the draft report, since a decision to increase the liability limit must be made by Congress and not the Commission, the Commission believes it may be more appropriate for Congress to determine whether to increase the liability limit based on full consideration of the types of consequences which may occur following an accident (i.e., early fatalities, early illnesses, latent cancer, and property damage). However, the Commission believes that the statutorily prescribed limits of liability should be adjusted to account for inflation.

The GAO report also recommends that the Commission reassess the Federal government indemnity. The Commission believes that there is no objective source of information available to reassess this indemnity and that this is an area for the exercise of Congressional judgment.

Finally, in response to the recommendation that the Commission reassess the financial impact of increasing the present $5 million retrospective premium, I have attached a copy of a financial impact study completed by the staff last year which updates earlier information contained in a 1976 report prepared for the Commission by Dr. Ronald Melicher of the University of Colorado, NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities" (copy enclosed). This report assessed the financial impact of various retrospective premiums on representative utilities. The staff study provides additional information in this area as well as a sensitivity analysis of the impact of increasing the retrospective premium to $20 million per reactor. This type of

review should be required for Congress in assessing the tradeoff between the costs of requiring additional protection through increased premiums and the costs of providing power. We do not present this study as definitive, since we are not experts in the financial management of utilities.

Sincerely,

John F. Ahearne

John F. Ahearne

Enclosures:
1. NUREG-0715, "Task Force Report on Interim Operation of Indian Point"
2. NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities"
3. Financial Impact Study

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

CHAIRMAN

December 31, 1980

Mr. James T. McIntyre, Jr., Director
Office of Management and Budget
Executive Office Building
Washington, D.C. 20503

Dear Mr. McIntyre:

The August 18, 1980 GAO report entitled "Analysis of the Price-Anderson Act" (EMD-80-80) recommends that the Nuclear Regulatory Commission undertake technical studies to assist Congress in determining a realistic limitation on liability for nuclear accidents.

There are probabilistic risk analysis models which can be used to calculate the off-site consequences in the event of a nuclear plant accident. The Calculations of Reactor Accident Consequences (CRAC) code, from the 1975 Reactor Safety Study (WASH-14\`\`), is used by the NRC staff to calculate reactor accident consequences, including early fatalities, early illnesses, latent cancers, and property damage. This code has been improved in some respects since 1975 and is continually being revised to incorporate improvements. For example, several computer codes, including CRAC, will be revised to reflect the lessons learned from the Three Mile Island accident and to incorporate recent research results. For a recent study, NUREG-0715, "Task Force Report on Interim Operation of Indian Point" (copy attached), the CRAC code was used to make risk comparisons of various reactor sites, reactor designs, and public protective measures.

In that comparison, off-site risks for six different reactor sites were estimated (see NUREG-0715, p. 17). The sites considered ranged from the Indian Point site, located in the most densely populated area, to the Diablo Canyon site, which is quite remote. The property damage estimates indicate that any accident which is serious enough to require evacuation of members of the general public is likely to cost $10 to $100 million. Accidents of this type have a calculated probability of about one in ten thousand per reactor year.

For lower probability accidents, the numbers are larger. As you know, these probabilistic estimates have wide ranges, depending on protective measures, design, sites, and uncertainties in the estimates (see NUREG-0715, p. 39). Thus for a probability of 10^{-6} per reactor year,

D-re
8101130646
3pp

the estimates for early fatalities range from none to 5,000. For a probability of 10^{-9}, estimates of early fatalities range from 700 to 50,000. Similarly the estimates for early illness range from 10 to 10,000 for a probability of 7×10^{-7} per reactor year and from 6,000 to 800,000 for a probability of 10^{-9}. Latent cancer estimates range from none to 200 for a 10^{-6} probability and from 200 to 2,000 for a 10^{-9} probability. Property damage estimates range from $2 million to $2 billion for a probability of 10^{-6} per reactor year, and from $8 billion to $100 billion for a probability of 10^{-9} (in 1974 dollars). We have not estimated the monetary costs associated with early fatalities, early illnesses or latent cancers.

In addition to the substantial uncertainties inherent in this type of calculation, there is a suspected bias in the model for the property damage analyses which the staff believes tends to underestimate the potential costs. The model uses criteria for interdicting the use of contaminated property and assumptions for cleanup of contaminated property which may be optimistic with respect to costs.

The GAO report recommends that the Commission realistically define a limit of liability for the Price-Anderson Act. As the Acting Executive Director for Operations stated in his letter to GAO commenting on the draft report, since a decision to increase the liability limit must be made by Congress and not the Commission, the Commission believes it may be more appropriate for Congress to determine whether to increase the liability limit based on full consideration of the types of consequences which may occur following an accident (i.e., early fatalities, early illnesses, latent cancer, and property damage). However, the Commission believes that the statutorily prescribed limits of liability should be adjusted to account for inflation.

The GAO report also recommends that the Commission reassess the Federal government indemnity. The Commission believes that there is no objective source of information available to reassess this indemnity and that this is an area for the exercise of Congressional judgment.

Finally, in response to the recommendation that the Commission reassess the financial impact of increasing the present $5 million retrospective premium, I have attached a copy of a financial impact study completed by the staff last year which updates earlier information contained in a 1976 report prepared for the Commission by Dr. Ronald Melicher of the University of Colorado, NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities" (copy enclosed). This report assessed the financial impact of various retrospective premiums on representative utilities. The staff study provides additional information in this area as well as a sensitivity analysis of the impact of increasing the retrospective premium to $20 million per reactor. This type of

review should be required for Congress in assessing the tradeoff between the costs of requiring additional protection through increased premiums and the costs of providing power. We do not present this study as definitive, since we are not experts in the financial management of utilities.

Sincerely,

John F. Ahearne

Enclosures:
1. NUREG-0715, "Task Force Report on Interim Operation of Indian Point"
2. NR-AIG-003, "Financial Implications of Retrospective Premium Assessments on Electric Utilities"
3. Financial Impact Study

NUREG-0715

Task Force Report on Interim Operation of Indian Point

Manuscript Completed: July 1980
Date Published: August 1980

R. M. Bernero, R. M. Blond, W. C. Pritchard,
M. A. Taylor, G. Eysymontt, G. Sege

Office of Policy Evaluation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

8001120626 DUPLICATE