Safety Evaluation Report

NUREG-0051
Suppl. No. 2 to NUREG75/092

U. S. Nuclear
Regulatory Commission

related to construction of

Koshkonong Nuclear Plant Units 1 and 2

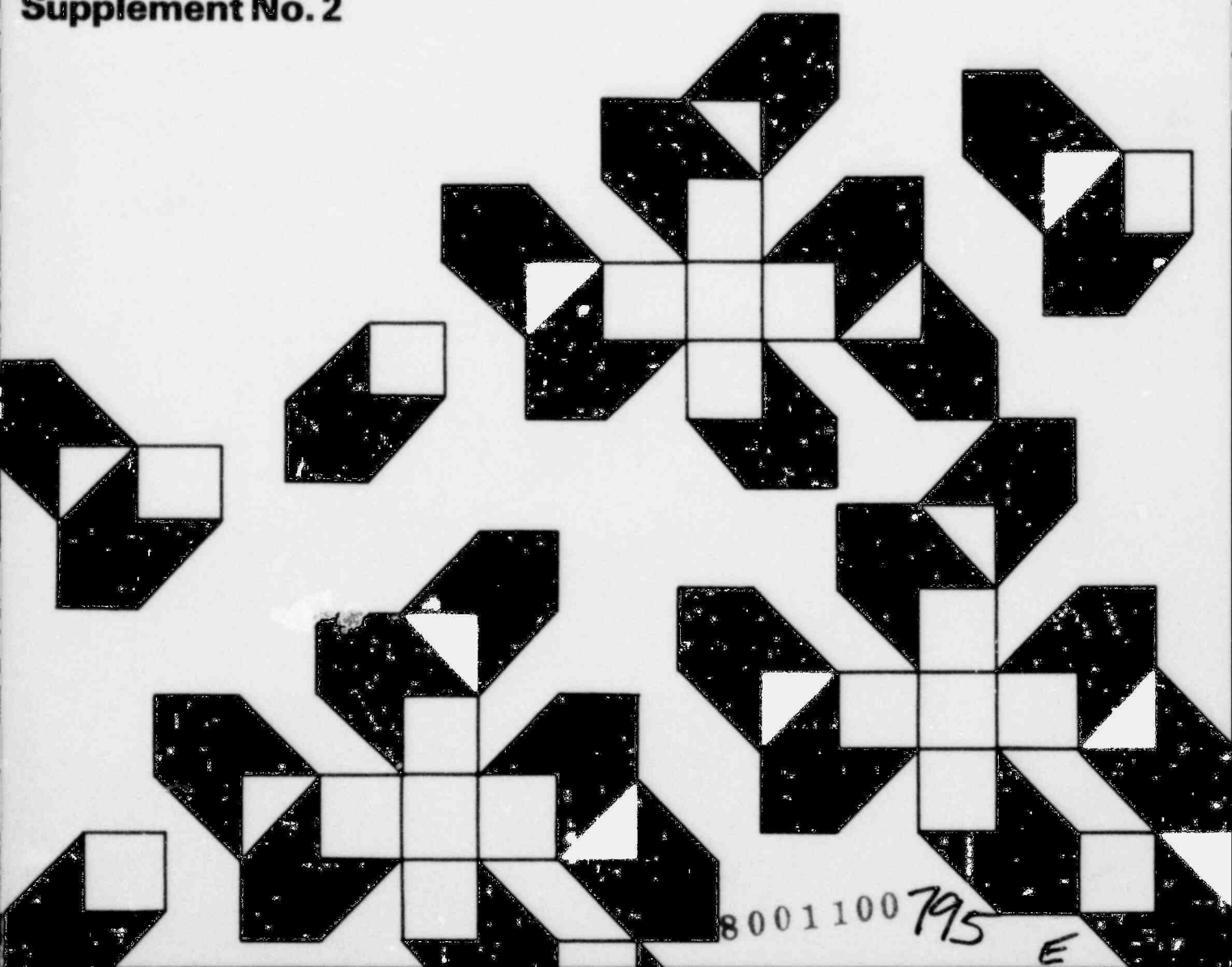
Office of Nuclear
Reactor Regulation

Docket Nos. STN 50-502
STN 50-503

Wisconsin Electric Power Company
Wisconsin Power and Light Company
Wisconsin Public Service Corporation
Madison Gas and Electric Company

July 1976

Supplement No. 2



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NUREG-0051

SUPPLEMENT NO. 2

TO

SAFETY EVALUATION REPORT

BY THE

OFFICE OF NUCLEAR REACTOR REGULATION

U. S. NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF

WISCONSIN ELECTRIC POWER COMPANY

WISCONSIN POWER AND LIGHT COMPANY

WISCONSIN PUBLIC SERVICE CORPORATION

AND

MADISON GAS AND ELECTRIC COMPANY

KOSHKONONG NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. STN 50-502 AND STN 50-503

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1.0 INTRODUCTION AND GENERAL DISCUSSION

1.1 Introduction

Since publication of Supplement Number 1 to the Safety Evaluation Report, an additional meeting has been held with representatives of the applicant, additional commitments have been made by the applicant regarding plant design, the staff has completed its review in certain areas, and the staff and the applicant have met with the Advisory Committee on Reactor Safeguards. The chronology of these activities is listed in Appendix A to this supplement. Those few items identified in Supplement Number 1 as requiring further attention by either the staff or the applicant now have been resolved, or the current status is such that no additional effort is required at this time.

The purpose of this supplemental report is to indicate the resolution or the current status of these remaining items, to complete or correct certain statements made in the Safety Evaluation Report, and to address the results of the meeting with the Advisory Committee on Reactor Safeguards. Upon publication of this supplemental report, the staff safety review is completed for this stage of the licensing process.

1.8 Outstanding Issues

The Safety Evaluation Report for the Koshkonong Nuclear Plant, Units 1 and 2, contained a listing in Section 1.8 of the items that remained outstanding as a result of the staff review of the application and a number of items for which the staff had not completed its review. Supplement Number 1 to the Safety Evaluation Report reported the then current status of those matters listed in Section 1.8, indicating that most of the items from the original listing had been satisfactorily resolved. The following listing, numbered as in Supplement Number 1, indicates the present status of those matters listed in Supplement Number 1 as being then not resolved. Additional discussion is provided in the appropriate sections of this supplement.

Matters for which additional information was required at the time Supplement Number 1 to the Safety Evaluation Report was prepared:

(11) Submittal of a failure mode and effects analysis for the engineered safety features actuation system (Section 7.3.1)-Resolved.

(16) Liquid and gaseous radwaste systems to meet the dose design objectives required by Appendix I to 10 CFR Part 50 (Section 11.1)-Resolved

(19) Quality assurance program (Sections 17.2 and 17.5)-Unresolved pending further review and inspection at time program is fully implemented.

Matters for which the staff review was not complete at the time Supplement Number 1 to the Safety Evaluation Report was issued:

(3) Analysis of Anticipated Transients Without Scram (ATWS), as presented in WCAP-8330 (Section 15.4)-Staff review complete; implementation underway.

Matters on which the staff and the applicant did not agree at the time Supplement Number 1 to the Safety Evaluation Report was published:

(2) Environmental qualification of the balance-of-plant equipment in accordance with IEEE Standard 323, 1974 (Sections 3.11 and 7.8.1)-Resolved.

(9) Proposed shift crew staffing for two-unit operation is not in accord with the staff position (Section 13.1)-Resolved.

2.0 SITE CHARACTERISTICS

2.1.3 Population and Population Distribution

The Safety Evaluation Report, on page 2-4, states that the combined peak daily attendance at all recreational activities within the Low Population Zone is estimated to be about 360 persons. Amendment 12 to the Koshkonong Site Addendum revised the estimated peak daily attendance at the Jellystone Campground, one of the recreational facilities within the Low Population Zone, to 950 persons, thus changing the combined peak daily attendance at all recreational activities within the Low Population Zone from 360 to 1175 persons. The staff has performed an additional evacuation analysis taking into account this revised population figure and we find that it does not affect our previous conclusions regarding the acceptability of the site, as presented in Section 2.1.4 of the Safety Evaluation Report.

2.4.1 Hydrologic Description

On page 2-15 of the Safety Evaluation Report, the word "Jonesville" on line 13 should be "Janesville."

2.5.1 Geology

The Safety Evaluation Report states that additional information regarding age of faulting in the Koshkonong area would be submitted in a later amendment. This information was submitted in Amendment 11 to the Koshkonong Site Addendum.

Low-level aerial reconnaissance and a field reconnaissance of the Janesville fault area were made, but without revealing geomorphic evidence of the fault or any fault exposure or other surface expression. The applicant contacted geologists knowledgeable of the geology in southern Wisconsin, regarding faulting in the area. The consensus of opinion among those geologists contacted is that the age of last movement on the Janesville fault occurred prior to Cretaceous time, or more than 136 million years before present. This is in agreement with the staff evaluation previously presented in Section 2.5.1.1 of the Safety Evaluation Report.

3.0 DESIGN CRITERIA FOR STRUCTURES, SYSTEMS, AND COMPONENTS

3.7 Seismic Design

This section of the Safety Evaluation Report discusses the seismic design input values proposed by the applicant and those values the staff considered appropriate as of the time the report was issued.

As discussed in Section 2.5.2 of Supplement Number 1 to the Safety Evaluation Report, the staff and the applicant now have resolved the differences in the input values to be used. We have determined that appropriate acceleration values to be used in the plant design are 0.2g for the Safe Shutdown Earthquake and 0.06g for the Operating Basis Earthquake.

This matter, therefore, is resolved.

3.8.1 Reactor Containment

The Preliminary Safety Analysis Report stated originally that the reactor containment would be designed in accordance with the criteria of the then Proposed Standard Code for Concrete Reactor Vessels and Containments, ACI-359, April 1973 edition. The staff Safety Evaluation Report notes the acceptability of containment design to these criteria.

This proposed code subsequently was adopted as an industry standard in January 1975, and Amendment 9 to the Preliminary Safety Analysis Report documented this change. Accordingly, the second paragraph on page 3-11 of the Safety Evaluation Report is modified to read as follows:

"This structure will be designed in accordance with the design criteria as outlined in the Article CC-3000 of the Code for Concrete Reactor Vessels and Containments, ACI-ASME 359, January 1975 edition."

3.11 Environmental Design of Electrical Equipment

As discussed in Supplement Number 1 to the Safety Evaluation Report, the matter of qualification of balance-of-plant equipment to the criteria of IEEE Standard 323, 1974, had not been completely resolved.

Following discussions at a further meeting between the staff and the applicant, the applicant forwarded a letter on April 22, 1976, committing to specific changes to the wording in the Preliminary Safety Analysis Report. With this clarification of wording, the staff now is satisfied that the qualification of balance-of-plant equipment will be performed in accordance with IEEE Standard 323, 1974. We therefore consider this matter to be resolved.

6.0 ENGINEERED SAFETY FEATURES

6.2.1 Containment Functional Design

In Amendment 10 to the Preliminary Safety Analysis Report, the applicant reported a change in the calculated peak pressure within containment from 40.9 to 41.7 pounds per square inch, gauge (psig). In the same amendment, the applicant also reported a change in the containment design internal pressure from 45 to 48 psig. Accordingly, the numbers shown in the Safety Evaluation Report for the containment design pressure and the calculated peak pressure are changed to 48 psig and 41.7 psig respectively.

The new design pressure provides a margin in excess of 15% above the calculated peak pressure, which more than meets the staff criterion of 10% margin and it is, therefore, acceptable.

6.3.2 System Design

The Safety Evaluation Report states that each of the three accumulator tanks will have a minimum borated water volume of 925 cubic feet. During the course of the analysis performed to demonstrate acceptability of the emergency core cooling system to meet the criteria of Appendix K to 10 CFR Part 50, the minimum contained water volume of each accumulator tank was changed to 1000 cubic feet. The Safety Evaluation Report thus should be changed to indicate 1000 cubic feet per tank.

7.0 INSTRUMENTATION AND CONTROLS

7.3.1 Failure Mode and Effects Analysis for ESF

The reactor vendor, Westinghouse Electric Corporation, has now submitted a topical report, WCAP-8584, "Failure Mode and Effects Analysis of the Engineering Safeguards Actuation System," which is applicable to the Koshkonong-Wisconsin Utilities Project units. The report will be reviewed by the staff and such further effort as may be required will be handled on a generic basis between the staff and Westinghouse.

It is understood that this topical report will adequately represent the final design of the Koshkonong engineered safety features systems. Should additional analysis be required because of features unique to the final design of the Koshkonong units, then the applicant will be required to submit this additional information for our review and approval prior to finalization of the design.

This matter will be addressed further during our review of the operating license application. For now, however, it is considered to be resolved.

7.8.1 Environmental Qualifications

As stated in Section 3.11 of this supplement, the applicant now has made commitments, satisfactory to the staff, to qualify balance-of-plant equipment in accordance with IEEE Standard 323, 1974. This matter, therefore, is resolved.

10.0 STEAM AND POWER CONVERSION SYSTEM

10.4 Circulating Water System

The Safety Evaluation Report states that the circulating water system will deliver approximately 524,100 gallons per minute of cooling water to the main condenser. The system will provide this approximate total flow; however, only about 504,600 gallons per minute are to the main condenser. The balance, about 19,500 gallons per minute, is flow to the turbine plant component cooling water system.

11.0 RADIOACTIVE WASTE MANAGEMENT

11.1 Summary Description

The Safety Evaluation Report stated that the capability of the liquid and gaseous radioactive waste treatment systems to meet the dose design objectives of Appendix I to 10 CFR Part 50 would be evaluated in a Supplement to the Safety Evaluation Report.

In a letter to the Nuclear Regulatory Commission, dated September 18, 1975, the applicant chose to comply with the September 4, 1975 Annex to Appendix I. This Annex permits an applicant the option of dispensing with the cost-benefit analysis required by Paragraph II.D of Appendix I, if the proposed or installed radwaste systems and equipment satisfy the Guides on Design Objectives for Light-Water-Cooled Nuclear Power Reactors proposed by the Regulatory Staff in the Rulemaking Proceeding on Appendix I (Docket RM 50-2).

Detailed descriptions of the radwaste management systems proposed for the Koshkonong Nuclear Plant, Units 1 and 2, will be presented in the Draft Environmental Statement (DES), scheduled to be issued by the Regulatory Staff in July of 1976. The DES will also contain a detailed analysis of the radwaste management systems based on the Staff's model of the proposed systems. However, our evaluation shows these systems to be capable of keeping levels of radioactive material in liquid and gaseous effluents to unrestricted areas "as low as is reasonable achievable" in accordance with 10 CFR Part 50.34a, Paragraph II.A, II.B, and II.C of Appendix I to 10 CFR Part 50, and the alternative to Paragraph II.D of Appendix I as provided in the Annex to Appendix I. We therefore find the radwaste management systems for the Koshkonong Nuclear Plant, Units 1 and 2, to be acceptable.

13.0 CONDUCT OF OPERATIONS

13.1 Organizational Structure of Applicant

The Safety Evaluation Report pointed out a disagreement between the applicant and the staff regarding the total number of licensed operators and the type of license held to be provided per shift for two-unit operation.

Following an additional meeting between the staff and the applicant, the applicant by letter dated April 22, 1976, has agreed to provide two licensed senior reactor operators per shift for two-unit operation. Further, the applicant has agreed to train and license a sufficient number of operators to satisfy the staff's requirement for minimum shift crew staffing for two-unit operation. We find this commitment to be acceptable at this stage of our review. However, we have agreed to consider this matter further with the applicant during our review for an operating license.

For now, we find the applicant's commitment's to be acceptable, and we consider this matter to be resolved.

15.0 ACCIDENT ANALYSES

15.4 Anticipated Transients Without Scram

Supplement Number 1 to the Safety Evaluation Report stated that the matter of resolution of anticipated transients without scram was under staff review and that a program was being developed for implementing the staff requirements in this regard.

The staff now has completed its review. A letter has been forwarded to the reactor vendor for the Koshkonong units, Westinghouse Electric Corporation, dated April 7, 1976, advising the vendor of the staff requirements for implementation of the program. Another letter is to be forwarded to the applicant in the near future, advising the applicant of staff actions and requesting submission to the staff by June 30, 1977, of:

(1) Additional analyses and justification of the Westinghouse analysis model, and

(2) Based on these analyses, identification of the design changes needed to assure that the limits specified in WASH-1270, "Anticipated Transients Without Scram for Water-Cooled Power Reactors," will not be violated following an anticipated transient without scram.

The applicant has stated that it will be feasible to incorporate changes in plant design likely to be required by the staff's implementation program. Final evaluation of this matter will have to await submittal of the necessary information by the applicant.

In the view of the staff, any changes necessary to meet the limits specified in WASH-1270 can be incorporated in the design of the Koshkonong units prior to completion of construction. We will review this matter further following the submittal by the applicant and again during our review of the operating license application. For now, however, we consider this matter to be resolved.

17.0 QUALITY ASSURANCE

17.2 Wisconsin Electric Power Company (WE)

As reported in Supplement Number 1 to the Safety Evaluation Report, the applicant has modified its organization such that quality assurance activities are now under control of the Senior Vice President of Wisconsin Electric Power Company, rather than under the Executive Vice President as was the case at the time the Safety Evaluation Report was prepared. The description of the applicant's quality assurance program therefore should be revised to indicate the responsibilities and authorities under the modified organization.

Our understanding of this corporate reorganization is that the change further separates responsibility for quality assurance from the cost and schedule responsibility for plant construction. The staff evaluation of the change must await receipt of an amendment to the Preliminary Safety Analysis Report describing the changed responsibilities.

17.5 Implementation

As noted in Supplement Number 1 to the Safety Evaluation Report, the ongoing quality assurance program is acceptable to the staff. The program has not been completely implemented as yet due to restrictions on expenditure of funds imposed by the Public Service Commission of Wisconsin. Final staff approval of the program implementation must await audit of the full implementation following removal of the restrictions on fund expenditures. Those portions of the program that have been implemented to date, however, are acceptable to the staff.

18.0 REVIEW BY THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

The application received further consideration by a Subcommittee of the Advisory Committee on Reactor Safeguards on May 5, 1976, and by the full Committee on May 7, 1976, during its 193rd meeting. As a result of these meetings, the Advisory Committee on Reactor Safeguards, on May 12, 1976, issued a "Report on Koshkonong Nuclear Plant, Units 1 and 2." This report is appended as Appendix E.

The Committee noted that the staff now has accepted the analysis submitted by the applicant to demonstrate compliance with Appendix K to 10 CFR Part 50 for the emergency core cooling system for the Koshkonong units. The Committee indicated its concurrence with this staff acceptance, but recommended aggressive pursuit of possible improvements in the reliability and function of the emergency core cooling system. Both the staff and the applicant are aware of the Committee's continuing desire for improvement in this area. Such improvements as are developed quite likely will be done generically. Should it appear that improvements would have a significant effect on the reliability and functioning of the emergency core cooling system, these improvements will be incorporated in the Koshkonong units where practicable and necessary. This matter will receive continuing attention during the plant construction phase and will be reviewed again in detail during the review for an operating license.

The Committee also indicated its concurrence with the selection of 0.06g and 0.2g as the appropriate acceleration values to be used for design of the Koshkonong plant for the Operating Basis Earthquake and the Safe Shutdown Earthquake, respectively. The Committee noted that the acceleration value for the Operating Basis Earthquake was selected on the basis of economics, and it urged the staff to develop general criteria for determination of acceptable values for the Operating Basis Earthquake. This effort is underway by the staff and the Committee will be informed of the results.

The Committee noted that implementation of the program to mitigate the consequences of anticipated transients without scram is underway and it requested to be kept informed. This matter is addressed in Section 15.4 of this supplement. Upon final resolution of this matter, a report will be forwarded to the Committee advising them of actions that have been or will be taken.

The Committee also noted that full implementation of the quality assurance program remains to be accomplished. This matter is addressed in Section 17.0 of this supplement.

The Committee reiterated the recommendation expressed in its January 15, 1976, interim report (Appendix C to Supplement Number 1) regarding design features to reduce the possibility and consequences of sabotage. This recommendation is addressed in Section 18.0 of Supplement Number 1.

Finally, the Committee recommended that the staff and the applicant deal in timely fashion with those generic problems relating to large water reactors which the Committee discussed in its Status Report Number 4, dated April 16, 1976. These matters are being addressed on a generic basis by the staff and the nuclear industry. At such time as improved system designs are available that offer substantial additional protection to the public health and safety, such improvements will be backfitted to the Koshkonong units where practicable and necessary.

20.0 FINANCIAL QUALIFICATIONS

20.1 Introduction

Wisconsin Electric Power Company, Wisconsin Power and Light Company, Wisconsin Public Service Corporation, and Madison Gas and Electric Company have applied for construction permits for the Koshkonong Nuclear Plant, Units 1 and 2. The Nuclear Regulatory Commission's regulations relating to the determination of an applicant's financial qualifications appear in Paragraph 50.33(f) and Appendix C to 10 CFR Part 50. In accordance with these regulations, there must be reasonable assurance that the applicants can obtain the necessary funds to cover estimated construction costs and related fuel cycle costs. This reasonable assurance standard, however, must be viewed in the light of the extended period of time from the start of construction to the commercial operation date. The earliest date for commercial operation is estimated to be February 1, 1983 for Unit 1 and July 1, 1984 for Unit 2. Consequently, one must necessarily make certain assumptions about future conditions. Two basic assumptions we have made in our analysis are that there will be rational regulatory policies with respect to the setting of rates and that viable capital markets will exist. The former assumption implies that rates will be set to at least cover the cost of service, including the cost of capital; the latter assumption implies that capital will be available at some price.

20.2 Construction Costs

The most recent estimate of the total cost of Koshkonong Units 1 and 2 was provided on April 19, 1976 in response to a Staff request for additional financial information. These costs may be summarized as follows:

Total nuclear production plant costs	$1,203,050,000
Transmission, distribution and general plant costs	44,140,000
Nuclear fuel inventory cost for first core	112,817,000
Allowance for funds used during construction (AFDC)	204,939,000
	$1,564,946,000

The total estimated costs, including AFDC, to be borne by each applicant are as follows:

	Amount (000)	Percentage
Wisconsin Electric Power Company	$932,879	59.6
Wisconsin Power and Light Company	294,953	18.8
Wisconsin Public Service Corporation	245,333	15.7
Madison Gas and Electric Company	91,781	5.9
	$1,564,946	100.0

The estimated cost of the nuclear production plant has been reviewed by comparing it with the cost projected by the Energy Research and Development Administration's Concept costing model. Using an escalation rate of 6 percent per year for site labor, materials, and purchased equipment, the model projected the cost of the nuclear production plant, excluding AFDC, to be $1,217 million, compared with the applicants' estimate of $1,203 million. It should be noted that the applicants' estimate includes contingency allowances of $21.5 million and $16 million for Unit 1 and Unit 2, respectively. Consequently, we have determined that it is reasonable to use the applicants' estimate in our analysis of their financial qualifications to undertake the proposed project.

20.3 Sources of Funds

20.3.1 Wisconsin Electric Power Company

Wisconsin Electric Power Company, the lead applicant, supplies electricity, gas, and steam in Wisconsin and upper Michigan. Operating revenues in 1975 were $506.6 million and net income was $49.0 million. Invested capital at December 31, 1975 amounted to $988.5 million and consisted of 46.6 percent long-term debt, 10.6 percent preferred stock, and 42.8 percent common equity. The return on common equity in 1975 was 10.0 percent, while the resulting pretax coverage of total interest charges was 4.13 times. The first mortgage bonds are rated double-A by both Moody's and Standard and Poor's.

The funds to finance Wisconsin Electric Power Company's ownership share in Koshkonong Units 1 and 2 will come from internally-generated funds, external sales of debt and equity securities, and short-term borrowings. Available funds from these sources in 1975, after debt retirements of $5.2 million, totaled $119.0 million. The internally-generated funds of $87.7 million represented 85.2 percent of 1975 construction expenditures (including nuclear fuel).

At our request, Wisconsin Electric Power Company supplied a projected sources of funds statement for the 1976-[illegible] period, with underlying assumptions, demonstrating how the requisite funds might be raised. These statistics are presented in Table 20.3-1. We have reviewed the projections and find them within the zone of reasonableness.

TABLE 20.3-1

Applicant: Wisconsin Electric Power Company Nuclear Plant: Koshkonong

Sources of Funds for System-Wide Construction Expenditures During Period of Construction of Subject Nuclear Power Plant
(millions of dollars)

	Construction Years of Subject Nuclear Plant									
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Security Issues and Other Funds										
Common Stock	1.0	2.0	42.0	2.0	92.0	62.0	122.0	2.0	57.0	2.0
Preferred Stock		35.0		35.0		55.0		70.0		
Long Term Debt		60.0		150.0	165.0	125.0	155.0	150.0		60.0
Notes Payable	12.0	(43.0)	55.0	12.0	17.0	9.0	8.0	12.0	5.0	(5.0)
Contributions from Parent - Net		(Not Applicable)								
Other Funds		(Not Applicable)								
Total	13.0	54.0	97.0	199.0	274.0	251.0	285.0	234.0	62.0	57.0
Internal Funds										
Net Income	56.2	61.9	63.8	74.3	77.0	96.2	107.1	131.6	136.7	148.2
Less:										
Preferred Dividends	7.1	10.4	10.4	13.7	13.7	19.0	19.0	25.6	25.6	25.6
Common Dividends	32.1	33.5	36.4	39.6	43.3	50.2	57.1	69.0	72.1	79.6
Retained Earnings	17.0	18.0	17.0	21.0	20.0	27.0	31.0	37.0	39.0	43.0
Deferred Taxes	17.0	15.0	16.0	17.0	18.0	24.0	27.0	28.0	31.0	34.0
Invest. Tax Cr. - Deferred	6.0	6.0	2.0	3.0	5.0	12.0	2.0	9.0	19.0	13.0
Depreciation and Amort.	45.0	46.0	43.0	50.0	53.0	64.0	67.0	75.0	89.0	99.0
Less AFDC			(2.0)	(11.0)	(24.0)	(29.0)	(37.0)	(47.0)	(32.0)	(9.0)
Total	85.0	85.0	81.0	80.0	72.0	98.0	90.0	102.0	146.0	180.0
Total Funds	98.0	139.0	178.0	279.0	346.0	349.0	375.0	336.0	208.0	237.0
Construction Expenditures*										
Nuclear Power Plants	7.2	11.0	33.0	43.9	109.0	145.1	195.8	218.4	116.6	119.3
Other	85.5	86.2	142.1	222.3	226.9	188.8	175.6	105.4	89.7	96.9
Total Const. Expenditures	92.7	97.2	175.1	266.2	335.9	333.9	371.4	323.8	206.3	216.2
Subject Nuclear Plant	6.9	8.5	32.1	42.2	99.6	135.0	181.1	192.5	73.3	15.7

*Exclusive of AFDC (allowance for funds used during construction)

TABLE 20.3-1 (Continued)

WISCONSIN ELECTRIC POWER COMPANY

ASSUMPTIONS

A. The rate of return on common stock equity used was 12 percent.

B. The incremental dividend rate on new issues of preferred stock is 9-1/2 percent.

C. 1. The growth rate for kilowatt hour sales for the Wisconsin Electric Power Company system is 4.4 percent from 1975 through 1980, and 4.1 percent from 1981 through 1984.

2. Expenses are expected to increase at approximately 6 percent per year for increases in materials and labor with revenues growing at an appropriate rate to provide the assumed return on common equity.

D. The assumed common stock market to book ratio for the projected common stock offering is 1.0.

E. The common stock dividend payout ratio will vary in the range of 65 percent to 68 percent.

F. The target capital structure for Wisconsin Electric Power Company is 48 percent to 50 percent long-term debt, 10 percent to 13 percent preferred stock and 38 percent to 41 percent common equity.

G. Fixed charge coverage on the SEC method ranges between 2.64 and 3.98 times during the period of construction. Interest coverage as defined by the indenture ranges between 2.91 and 5.53 times during the period of construction.

H. 1. The incremental long-term interest rate assumption is 9 percent.

2. The assumed short-term interest rate over the period of construction is 8 percent.

20.3.2 Wisconsin Power and Light Company

Wisconsin Power and Light Company supplies electricity, gas, and water to central and southern Wisconsin. Operating revenues in 1975 were $196.6 million and net income was $21.1 million. Invested capital at December 31, 1975 amounted to $427.6 million and consisted of 44.3 percent long-term debt, 17.5 percent preferred stock, and 38.2 percent common equity. The return on common equity in 1975 was 10.3 percent, while resulting pretax coverages of long-term interest and total interest charges were 4.59 times and 3.68 times, respectively. The first mortgage bonds are rated double-A by both Moody's and Standard and Poor's.

The funds to finance Wisconsin Power and Light Company's ownership share in Koshkonong Units 1 and 2 will come from internally-generated funds, external sales of debt and equity securities, and short-term borrowings. Available funds from these sources in 1975, after debt refinancing and sinking fund requirements of $24.6 million, totaled $57.9 million. The internally-generated funds of $36.8 million represented 63.6 percent of 1975 construction expenditures (including nuclear fuel).

At our request, Wisconsin Power and Light Company supplied a projected sources of funds statement for the 1976-84 period, with underlying assumptions, demonstrating how the requisite funds might be raised. These statistics are presented in Table 20.3-2. We have reviewed the projections and find them within the zone of reasonableness.

20.3.3 Wisconsin Public Service Corporation

Wisconsin Public Service Corporation supplies electricity and gas in northern Wisconsin and the upper peninsula of Michigan. Operating revenues in 1975 were $219.9 million and net income was $23.5 million. Invested capital at December 31, 1975 amounted to $431.4 million and consisted of 47.7 percent long-term debt, 15.3 percent preferred stock, and 37.0 percent common equity. The return on common equity in 1975 was 11.9 percent, while resulting pretax coverages of long-term interest and total interest charges were 4.59 times and 4.19 times, respectively. The first mortgage bonds are rated double-A by Moody's and single-A by Standard and Poor's.

The funds to finance Wisconsin Public Service Corporation's ownership share in Koshkonong Units 1 and 2 will come from internally-generated funds, external sales of debt and equity securities, and short-term borrowings. Available funds from these sources in 1975, after debt refinancing and sinking fund requirements of $9.8 million, totaled $44.8 million. The internally-generated funds of $38.2 million represented 79.4 percent of 1975 construction expenditures (including nuclear fuel).

TABLE 20.3-2

Applicant: Wisconsin Power and Light Company Nuclear Plant: Koshkonong

Sources of Funds for System-Wide Construction Expenditures During Period of Construction of Subject Nuclear Power Plant
(millions of dollars)

Security Issues and Other Funds	Construction Years of Subject Nuclear Power Plant								
	1976	1977	1978	1979	1980	1981	1982	1983	1984
Common Stock	$25.0	$ -	$25.0	$ -	$38.0	$40.0	$21.0	$ -	$ -
Preferred Stock	-	-	-	-	25.0	25.0	-	-	-
Long Term Debt	4.3	35.0	(5.0)	50.0	54.0	57.2	54.8	-	(13.6)
Notes Payable	(3.0)	(3.2)	(10.8)	(19.1)	11.1	15.4	(14.6)	(13.5)	(29.8)
Contributions from Parent - Net	-	-	-	-	-	-	-	-	-
Other Funds (Sinking)	(2.1)	(2.1)	(2.1)	(3.2)	(3.2)	(3.7)	(4.3)	(4.9)	(4.9)
Total	24.2	29.7	7.1	27.7	124.9	133.9	56.9	(18.4)	(48.3)
Internal Funds									
Net Income	30.3	31.4	32.4	34.4	39.5	47.1	54.6	57.9	58.6
Less:									
Preferred Dividends	5.6	5.6	5.6	5.6	5.5	8.1	10.6	10.6	10.6
Common Dividends	17.1	18.3	18.8	19.5	23.5	27.5	31.5	34.0	34.5
Retained Earnings	7.6	7.5	8.0	9.3	10.5	11.5	12.5	13.3	13.5
Deferred Taxes	-	-	-	-	-	-	-	-	-
Invest. Tax Cred. - Deferred	3.6	2.7	3.1	1.9	5.8	.6	10.2	5.6	4.9
Depreciation and Amort.	30.4	30.6	37.8	38.8	39.1	41.0	43.4	50.5	72.9
Less: AFDC	.8	3.4	.7	2.0	10.0	16.6	23.2	10.9	2.8
Total	40.8	37.4	48.2	48.0	45.4	36.5	42.9	68.5	88.5
Total Funds	$65.0	$67.1	$55.3	$75.7	$170.3	$170.4	$99.8	$50.1	$40.2
Construction Expenditures*									
Nuclear Power Plants	$ 2.8	$10.5	$13.8	$32.5	$44.0	$59.0	$62.7	$23.9	$ 5.1
Other	62.2	56.6	41.5	43.2	126.3	111.4	37.1	26.2	35.1
Total Construction Expenses	$65.0	$67.1	$55.3	$75.7	$170.3	$170.4	$99.8	$50.1	$40.2
Subject Nuclear Plant	$ 2.8	$10.5	$13.8	$32.5	$44.0	$59.0	$62.7	$23.9	$ 5.1

*Exclusive of AFDC (allowance for funds used during construction)

TABLE 20.3-2 (Continued)

WISCONSIN POWER AND LIGHT COMPANY

ASSUMPTIONS

A. The rate of return on average common stock equity used was 14 percent.

B. The incremental dividend rate on new issues of preferred stock is 10-1/2 percent.

C. 1. The growth rate for kilowatt hour sales for Wisconsin Power and Light Company is 5.5 percent for 1976, 9.1 percent for 1977, 7.7 percent for 1978, 6.8 percent for 1979 and 6.5 percent thereafter.

2. Expenses are expected to increase at approximately 6 percent per year for increases in materials and labor with revenues growing at an appropriate rate to provide the assumed return on common equity.

D. The assumed common stock market to book ratio for the projected common stock offerings is 1.0.

E. The common stock dividend payout ratio will vary in the range of 65 percent to 75 percent.

F. The target capital structure for Wisconsin Power and Light Company is 50 percent long-term debt, 10 percent to 15 percent preferred stock and 35 percent to 40 percent common equity.

G. The indenture interest coverage assuming a 40 percent common equity capital structure and 14 percent return on common equity would approximate 3.7 times.

H. 1. The incremental long-term interest rate assumption is 10.5 percent.

2. The assumed short-term interest rate over the period of construction is 8 percent.

At our request, Wisconsin Public Service Corporation supplied a projected sources of funds statement for the 1976-84 period, with underlying assumptions, demonstrating how the requisite funds might be raised. These statistics are presented in Table 20.3-3. We have reviewed the projections and find them within the zone of reasonableness.

20.3.4 Madison Gas and Electric Company

Madison Gas and Electric Company furnishes electric and gas service in the City of Madison, Wisconsin, and surrounding areas. Operating revenues in 1975 were $74.6 million and net income was $8.0 million. Invested capital at December 31, 1975 amounted to $194 million and consisted of 54.1 percent long-term debt, 14.1 percent preferred stock, and 31.8 percent common equity. The return on common equity in 1975 was 10.0 percent, while resulting pretax coverages of long-term interest and total interest charges were 2.98 times and 2.53 times, respectively. The first mortgage bonds are rated double-A by Moody's and single-A by Standard and Poor's.

The funds to finance Madison Gas and Electric Company's ownership share in Koshkonong Units 1 and 2 will come from internally-generated funds, external sales of debt and equity securities, and short-term borrowings. Available funds from these sources in 1975, after debt refinancing of $41.3 million, totaled $39.1 million. The internally-generated funds of $16.2 million represented 50.2 percent of 1975 construction expenditures (including nuclear fuel).

At our request, Madison Gas and Electric Company supplied a projected sources of funds statement for the 1976-84 period, with underlying assumptions, demonstrating how the requisite funds might be raised. These statistics are presented in Table 20.3-4. We have reviewed the projections and find them within the zone of reasonableness.

20.4 Conclusion

We have reviewed the financial information in the application, and amendments thereto, and conclude that there is reasonable assurance that the applicants can raise the necessary funds to design and construct the Koshkonong Nuclear Plant, Units 1 and 2. Our conclusion is based upon an assessment that the financing projections submitted by the applicants constitute reasonable financing plans. We do not consider these projections to be a forecast of what will necessarily occur. They need only demonstrate one possible way by which the planned construction program, including the subject facility, might reasonably be financed. It is to be expected that financing plans will change from time to time to accommodate changing conditions. The financing being proposed is in accord with general industry practices and the assumptions being used, although not susceptible to precise measurement against absolute criteria, are in line with what one might expect under the postulated conditions. If the financing projections can be

TABLE 20.3-3

Applicant: Wisconsin Public Service Corporation Nuclear Plant: Koshkonong

Sources of Funds for System-Wide Construction Expenditures During Period of Construction of Subject Nuclear Power Plant
(millions of dollars)

	Construction Years of Subject Nuclear Power Plant									
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Security Issues and Other Funds										
Common Stock	$	$16.5	$	$15.0	$20.0	$25.0	$20.0	$	$	$20.0
Preferred Stock					14.2	14.2	(.8)	19.2	(.8)	(.8)
Long-Term Debt	9.6	(1.4)	20.9	21.6	21.5	46.8	39.0	(1.0)	39.0	30.0
Notes Payable	(7.4)	(6.0)	.2	(9.7)	17.4	9.7	2.4	32.4	6.8	(5.4)
Contributions from Parent-Net										
Other Funds										
Total	2.2	9.1	21.1	26.9	73.1	95.7	60.6	50.6	45.0	43.8
Internal Funds										
Net Income		(Not Available)								
Less:										
Preferred Dividends		(Not Available)								
Common Dividends		(Not Available)								
Retained Earnings	4.7	5.4	6.3	6.8	7.7	8.7	9.8	10.5	10.9	11.6
Deferred Taxes		(Included in Depreciation)								
Invest. Tax Cred.-Deferred	3.7	2.9	1.3	2.1	3.9	3.1	3.0	3.0	3.0	3.0
Depreciation and Amort.	29.9	29.8	30.5	32.3	33.7	35.2	36.7	38.2	39.7	41.2
Other	5.4	(.6)	1.5	.5						
Total	43.7	37.5	39.6	41.7	45.3	47.0	49.5	51.7	53.6	55.8
TOTAL FUNDS	$45.9	$46.6	$60.7	$68.6	$118.4	$142.7	$110.1	$102.3	$98.6	$99.6
Construction Expenditures*										
Nuclear Power Plants	$10.0	$ 8.2	$17.6	$19.2	$36.5	$49.5	$62.9	$80.7	$76.8	$77.3
Other	35.9	38.4	43.1	49.4	81.9	93.2	47.2	21.6	21.8	22.3
Total Const. Expenses	$45.9	$46.6	$60.7	$68.6	$118.4	$142.7	$110.1	$102.3	$98.6	$99.6
Subject Nuclear Plant	$ 1.9	$ 2.3	$ 8.8	$11.5	$ 27.2	$ 36.9	$ 49.4	$ 52.6	$20.0	$ 4.3

*Exclusive of AFDC (allowance for funds used during construction)

TABLE 20.3-3 (Continued)

WISCONSIN PUBLIC SERVICE CORPORATION

ASSUMPTIONS

A. The rate of return on common stock equity used was 11.5 percent.

B. The incremental dividend rate on new issues of preferred stock is 10 percent.

C. 1. The incremental long-term interest rate assumption is 10 percent.

2. The assumed short-term interest rate over the period of construction is 8 percent.

D. The assumed common stock dividend payout ratio is 70 percent.

E. The target capital structure is 35 percent to 40 percent common equity, 12 percent to 15 percent preferred equity, 45 percent to 50 percent long-term debt, and 0 percent to 5 percent short-term debt.

F. The pretax fixed charge coverage ranges between 3.41 times and 4.33 times during the period of construction.

G. It is assumed that current security prices will continue during the period of construction.

H. It is assumed that any rate relief granted during the period of construction will provide a fair rate of return on construction work in progress. Consequently, no provision is made for Allowance For Funds Used During Construction.

TABLE 20.3-4

Applicant: Madison Gas & Elec. Co. Nuclear Plant: Koshkonong

Sources of Funds for System-Wide Construction Expenditures During Period of Construction of Subject Nuclear Power Plant
(millions of dollars)

	Construction Years of Subject Nuclear Power Plant								
	1976	1977	1978	1979	1980	1981	1982	1983	1984
Security Issues and Other Funds									
Common Stock	$ 7.7	$	$ 8.6	$	$	$	$	$	$
Preferred Stock	5.0			5.0		10.0			
Long-Term Debt		20.0			20.0		20.0		
Notes Payable	4.1	(2.9)	(2.2)	5.8		8.6	(1.5)	.6	(10.2)
Contributions from Parent-Net									
Other Funds	(.9)	(1.3)	(1.7)	(3.4)	(2.2)	(2.4)	(2.3)	(4.5)	(5.1)
Total	15.9	15.8	4.7	7.4	17.8	16.2	16.2	(3.9)	(15.3)
Internal Funds									
Net Income	11.0	12.9	13.9	15.3	16.1	17.3	18.3	18.8	19.3
Less:									
Preferred Dividends	(2.8)	(3.2)	(3.1)	(3.4)	(3.6)	(4.1)	(4.5)	(4.3)	(4.1)
Common Dividends	(4.9)	(5.7)	(6.6)	(7.4)	(7.8)	(8.2)	(8.6)	(9.0)	(9.4)
Retained Earnings	3.3	4.0	4.2	4.5	4.7	5.0	5.2	5.5	5.8
Deferred Taxes (a)									
Invest. Tax Cred.-Deferred (b)	2.6	2.0	4.3	1.3	1.8	1.4	1.5	5.8	5.9
Depreciation and Amort. (a)	13.6	14.7	16.5	18.0	19.5	21.0	22.5	25.8	30.7
Less: AFDC	(.6)	(1.1)	(.4)	-	(.7)	(1.2)	(1.8)	(1.0)	(.4)
Total	18.9	19.6	24.6	23.8	25.3	26.2	27.4	36.1	42.0
TOTAL FUNDS	$34.8	$35.4	$29.3	$31.2	$43.1	$42.4	$43.6	$32.2	$26.7
Construction Expenditures*									
Nuclear Power Plants	$ .9	$ 3.5	$ 4.5	$10.7	$14.5	$19.5	$20.7	$ 7.9	$ 1.7
Other	33.9	31.9	24.8	20.5	28.6	22.9	22.9	24.3	25.0
Total Const. Expenses	$34.8	$35.4	$29.3	$31.2	$43.1	$42.4	$43.6	$32.2	$26.7
Subject Nuclear Plant	$ .9	$ 3.5	$ 4.5	$10.7	$14.5	$19.5	$20.7	$ 7.9	$ 1.7

*Exclusive of AFDC (allowance for funds used during construction)
(a) As prescribed by the Public Service Commission of Wisconsin, deferred taxes are recorded as additional depreciation.
(b) Amounts are "net" (deferred less amounts restored to income).

characterized as reasonable, we believe that the reasonable assurance standard has been satisfied. Accordingly, we find the applicants financially qualified to carry out the activities for which this permit is sought.

APPENDIX A

CHRONOLOGY OF RADIOLOGICAL REVIEW (Continued)

April 14, 1976	Supplement Number 1 to Safety Evaluation Report Issued.
April 20, 1976	Meeting with applicant to discuss open items pertaining to control room staffing and environmental qualification of balance-of-plant equipment.
April 22, 1976	Letter from applicant with commitments regarding control room staffing and environmental qualification of balance-of-plant equipment.
May 5, 1976	Meeting with ACRS Subcommittee.
May 7, 1976	Meeting with ACRS.
May 12, 1976	ACRS report issued.

APPENDIX E

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

May 12, 1976

Honorable Marcus A. Rowden
Chairman
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: REPORT ON KOSHKONONG NUCLEAR PLANT, UNITS 1 AND 2

Dear Mr. Rowden:

During its 193rd meeting, May 6-8, 1976, the Advisory Committee on Reactor Safeguards completed its review of the application of the Wisconsin Electric Power Company, Wisconsin Power and Light Company, Wisconsin Public Service Corporation, and Madison Gas and Electric Company (the Applicants) for a permit to construct the Koshkonong Nuclear Plant, Units 1 and 2. The site was visited on October 17, 1975. The application had been previously reviewed at the Committee's 188th meeting, January 8-10, 1976, and at Subcommittee meetings in Ft. Atkinson, Wisconsin on October 17, 1975 and Washington, DC on December 3, 1975 and May 5, 1976. The Committee issued an Interim Report dated January 15, 1976. During its review, the Committee had the benefit of discussions with representatives and consultants of the Applicants, Westinghouse Electric Corporation, Stone and Webster Corporation, the Nuclear Regulatory Commission (NRC) Staff, and of the documents listed.

The application to build the Koshkonong Nuclear Plant is a part of the Wisconsin Utilities Project (WUP), for licenses to construct one or more standardized nuclear power plants at one or more sites in Wisconsin, using the duplicate plant option, Appendix N to 10 CFR Part 50. The Committee is restricting its current review to Koshkonong Units 1 and 2 since the schedule for the other plants is not well specified, and it may be appropriate to incorporate design changes in the plans for the future plants.

The Applicants used the October 1975 Westinghouse emergency core cooling system (ECCS) model as approved by the NRC Staff to demonstrate compliance with Appendix K to 10 CFR Part 50. The limiting peaking factor at full power is 2.18. The Applicants have committed to install an Axial Power

Distribution Monitoring System or otherwise to demonstrate the capability to manage core power distribution within the limiting peaking factor envelope. The NRC Staff considers this resolution of the ECCS evaluation adequate for purposes of issuance of a construction permit. The Committee concurs with this conclusion; however, the Committee recommends aggressive pursuit of possible improvements in the reliability and function of the ECCS for Koshkonong Units 1 and 2.

The Applicants and the NRC Staff have agreed that horizontal ground accelerations of 0.2g and 0.06g are appropriate design values for the safe shutdown earthquake (SSE) and operating basis earthquake (OBE), respectively. The Committee concurs with these values for the Koshkonong Plant. The Applicants selected the OBE on the basis of economics, holding that the minimum value of the OBE is not safety related. The NRC Staff required the Applicants as a part of their economic evaluation to demonstrate that an earthquake equivalent to the OBE would have a reasonably long return interval. Applying a probabilistic analysis to historic data of the tectonic province, the Applicants estimated a return interval of 1,000 years. The NRC Staff accepted this as a reasonable period. In this regard, the Committee urges the NRC Staff to develop general criteria for the determination of an acceptable OBE. The Committee wishes to be kept informed.

The NRC Staff has completed its evaluation of the liquid and gaseous radioactive waste treatment systems and has concluded that these systems are capable of meeting the design objectives of Appendix I to 10 CFR Part 50.

Two outstanding issues remain to be resolved prior to the NRC Staff recommendation for issuance of a construction permit:

(1) The NRC Staff's review of the Westinghouse Analysis of Anticipated Transients Without Scram (ATWS), WCAP-8330, will be completed in the next few weeks and the final implementation plan for the Koshkonong Plant is under development. The Applicants have stated that it will be feasible to accommodate changes in plant design likely to be required by the implementation program. The Committee wishes to be kept informed.

(2) The implementation of the quality assurance program will remain an outstanding issue until the restrictions imposed by the Public Service Commission of Wisconsin on fund expenditures are removed. The Committee recommends that this issue be resolved to the satisfaction of the NRC Staff.

The Committee believes that the Applicants and the NRC Staff should review the Koshkonong Plant for design features that could significantly reduce the possibility and consequences of sabotage, and that such features should be incorporated into the plant design where practicable. The Committee wishes to be kept informed.

Generic problems relating to large water reactors are discussed in the Committee's April 16, 1976 Status Report Number 4. These problems should be dealt with in a timely fashion by the NRC Staff and the Applicants.

The Advisory Committee on Reactor Safeguards believes that the items mentioned above and those of the Committee's letter of January 15, 1976, can be resolved during construction and that, if due consideration is given to the foregoing, the Koshkonong Nuclear Plant, Units 1 and 2 can be constructed with reasonable assurance that they can be operated without undue risk to the health and safety of the public.

Sincerely yours,

Dade W. Moeller

Dade W. Moeller
Chairman

References

1. Koshkonong Nuclear Plant Units 1 and 2, Preliminary Safety Analysis Report (August 1974) with Amendments 1 through 10.

2. Koshkonong Nuclear Plant PSAR Site Addendum (August 1974) with Amendments 1 through 10.

3. Safety Evaluation Report NUREG-75/092 related to construction of the Koshkonong Nuclear Plant Units 1 and 2, October 1975.

4. Safety Evaluation Report NUREG-0053 (Supplement to NUREG 75/092) related to construction of Koshkonong Nuclear Plant, Units 1 and 2, April 1976