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National Environmental Studies Project

July 29, 1980

Mr. Don Calkins
U.S. Nuclear Regulatory Commission
N.L. 5650
Washington, D.C. 20555

Dear Don:

Enclosed for your information is the scope of work for the study of decommissioning costs being conducted through the Forum's National Environmental Studies Project.

Sincerely,

Paul J. Pettit
Project Manager

PJP:ao'd

Attachment 1

NUCLEAR POWER PLANT DECOMMISSIONING

TECHNICAL SCOPE OF WORK

BACKGROUND

Since November 1976 when the National Environmental Studies Project (NESP) published "An Engineering Evaluation of Nuclear Power Reactor Decommissioning Alternatives", interest in the retirement of power reactors has grown. The Department of Energy and the Nuclear Regulatory Commission have each commissioned independent critiques of the 1976 NESP report findings. In addition, each agency has performed its own analysis. Other groups and private firms as well have prepared technical reports on the subject of decommissioning.

Licensing actions and rate cases have focussed a great deal of attention on the NESP study and these other analyses. Many people have questioned the apparent dissimilarities in the economics of decommissioning alternatives from report to report, as well as the varying technical assumptions on which the economics were based. A critical review of these reports would provide a valuable perspective to the industry, the regulators, and members of the public.

Further impetus for action on the subject of decommissioning comes from the Nuclear Regulatory Commission (NRC). While the NRC's regulatory guides and regulations embody the Commission's current approach to reactor decommissioning, new steps are being taken to improve future decommissioning practices for all nuclear facilities. NUREG-0436, Revision 1, "Plan for Reevaluation of NRC Policy on Decommissioning of Nuclear Facilities" (December 1978) indicates the general framework for their reappraisal. The program includes a basic series of studies covering the technology, safety and costs of decommissioning reference nuclear facilities. A second series of studies covers supporting information on decommissioning of nuclear facilities -- an annotated bibliography on decommissioning, a review and analysis of current decommissioning regulations, and facilitation of decommissioning of light water reactors. Some of these studies have been published already; the remainder are tentatively scheduled to be completed by the end of FY 1980.

Concurrently, the NRC is initiating a series of rulemaking actions on decommissioning. These include preparation of a generic environmental impact statement, revision of their policy statement, and development of proposed rule changes. All of these actions are currently slated to take place between now and September 1980. For the industry to be effective in helping shape decommissioning practices of the future, a coordinated effort to provide supplementary technical information is needed.

The project described below is designed to fulfill several needs of the nuclear industry. This work will be of great help to utilities in establishing soundly supported cases for desirable and economical methods for accomplishing and financing decommissioning. Success of this project could offer rate relief of as much as $2,000,000 per plant per year.

This project is confined to the decommissioning aspects of conventional light-water-reactor generating stations (BWR and PWR). It does not include decommissioning of other fuel cycle facilities. Although a detailed look specifically at premature decommissioning is not desired, some assessment and supportive evidence of our conclusion that premature decommissioning is not distinct, or to be set apart from, end-of-life decommissioning would be beneficial. The projects are intended to develop no new methods of decommissioning, yet the intent is to develop a new or improved methodology for estimating costs and relative results or benefits of the various methods of decommissioning.

The contractor chosen for this effort must review and make optimum use of all relevant materials on the subject, especially literature which may influence the development and implementation of this effort. The contractor should expect to work closely with the NESP staff and task force in detailed definition of the work, in obtaining information and in defining key assumptions and criteria.

Proposals should be structured in such a way that each proposed phase can be evaluated separately by the reviewers. Depending on the qualifications and expertise of the bidding organization (as it relates to each phase), the reviewers reserve the right to award separate contracts for each phase.

SCOPE OF WORK

PHASE #1 - CURSORY ANALYSIS OF RECENT DECOMMISSIONING STUDIES AND FINANCING ALTERNATIVES

Purpose

To compare the 1976 NESP study of decommissioning alternatives with other recent studies of the same subject, to reconcile different results, and to summarize decommissioning costs and methods for financing.

Task 1 Comparison of Differences

1.1 Identify all relevant (both domestic and foreign) technical studies of decommissioning alternatives which have been performed since 1976. This includes, but is not restricted to: the 1976 NESP study, the critiques of the NESP study by DOE and NRC, the GAO report, contract studies by Battelle, Bechtel and NUS.

1.2 Identify relevant information presented in rate hearings and in congressional hearings.

1.3 Review all relevant technical studies to identify the apparent differences in their findings and characterize the areas of agreement and of disagreement. Particular attention should be paid to such findings as cost, environmental effects, and worker radiation exposure.

1.4 Where differences exist in the results or conclusions, determine to the extent possible from the reports themselves the reasons for the differences. Such factors as assumptions used, method of calculation, reference time for the cost estimates, technology applied, site parameters and plant size should be investigated.

1.5 Based on the information gathered, reconcile the various estimates of costs, exposures, effects, etc. for each decommissioning mode.

Task 2 Financing Methods for Decommissioning

2.1 Identify alternative methods for financing nuclear power plant decommissioning. Methods considered should include, but not be limited to, escrow accounts, sinking funds and other trust funds, and negative salvage value in the depreciation rate. Determine in general terms how each financing method works.

2.2 For each method of financing identified in Task 2.1, outline the advantages and disadvantages, and estimate the cost to rate payers in terms of the annual amount of funds that must be obtained or made available to finance the end-of-life decommissioning of a representative plant.

2.3 Determine if there is a single, optimum, universally applicable method of financing the decommissioning of nuclear power plants. Support the findings or conclusions by appropriate examples or facts.

Note: It will be important for the contractor to communicate and work closely with the Task Force to assure that the intent of this task is fully understood.

Task 3 Presentation of Results

3.1 Present oral reports to the task force on the results of Tasks 1 and 2.

3.2 Prepare a concise report on the findings and results of Tasks 1 and 2 suitable for widespread distribution to members of the industry, the government and the general public.

PHASE #2 DETAILED INVESTIGATION OF DECOMMISSIONING ALTERNATIVES

Purpose

To examine in detail the cost, financing and results of decommissioning, as well the impact on the utility industry of existing and incipient regulatory policies. The studies to be considered will be identified in Phase 1. The difference between the comparison contemplated here and the comparison performed in Phase 1 is that the first analysis is restricted to what can be gleaned from examination of the various study reports themselves. In the Phase 2 effort, additional data may have to be gathered from the group which performed each study.

Task 1 Detailed Comparison of Decommissioning Studies

1.1 Determine in detail the technical reasons for differences in results or conclusions from the various technical studies of decommissioning.

1.2 Provide a detailed topical report on Task 1.

Task 2 New Technology

Identify procedures, methods or new technologies for accomplishing decommissioning which have not been considered in previous studies. Examples include decontamination techniques, new methods for disassembly of structures and hardware, and new plant design considerations. Evaluate these new methods and technologies and identify the advantages and disadvantages of each.

Task 3 Sensitivity Analysis

3.1 Identify factors or parameters which may significantly affect decommissioning costs. This analysis should include site or plant specific factors as well as relevant regulatory issues such as waste disposal.

3.2 Develop a method for performing a sensitivity analysis to quantify the affect of (changes in) various parameters on the overall cost of decommissioning. Document the basis of the sensitivity analysis, including assumptions.

3.3 Perform a sensitivity analysis for each of the factors identified in Task 3.1, and determine to what (relative) extent each parameter can affect the cost of decommissioning.

Note: Bidders must cite the basis for their proposed sensitivity analysis in their proposal.

3.4 Provide a detailed topical report on Task 3.

Task 4 Regulatory Impacts

4.1 Characterize current and pending regulatory policies, practices and guidelines that can directly or indirectly affect utility decommissioning plans or practices. The concerns of both Federal and State agencies should be considered.

The issues and policies considered should include but not be limited to: power plant siting, occupational radiation exposure, high level waste disposal, low level waste management and transportation.

4.2 Determine the potential impact of these issues on future decommissioning plans of nuclear power plant owners.

4.3 Provide a detailed topical report on Task 4.

Task 5 Presentation of Results

5.1 Provide a comprehensive technical document based on the activities in Tasks 1-4. This document may be produced by combining sections of topical reports.

5.2 Provide a technically correct summary in non-technical language of the following topics:

a. How decommissioning could be/ is/ has been accomplished
   - o the methods and their advantages and disadvantages
   - o time requirements - near, mid and long term considerations
   - o type of decisions that have to be made

b. The costs
   - o factors that contribute to cost
   - o the range of costs
   - o how decommissioning costs compare to cost of power plant replacement
   - o the influence of different financing methods and the regulations on costs

c. The Regulations that pertain to decommissioning
   - o NRC, EPA
   - o other boundary conditions

d. Environmental Impacts
   - o amount of waste generated for each method of decommissioning and comparison to other methods
   - o options for disposal
   - o other impacts
   - o radiation exposure to workers and the public

Phase 3 - COST/BENEFIT METHODOLOGY FOR ALTERNATIVE DECOMMISSIONING METHODS

Purpose

To develop a user-oriented method for estimating the costs of nuclear power plant decommissioning alternatives on a plant-specific basis. This effort is intended to be more comprehensive than related efforts in Phase 2, and should consider several different aspects of "cost" such as environmental effects, radiation exposure, in addition to the dollar costs of decommissioning. The method should be capable of providing decision-making information on different approaches to decommissioning (mothballing, entombment, prompt removal), as well as an on alternatives such as disassembly methods, decontamination, waste handling, etc.

Task

Develop a method for technical specialists to use for estimating the costs and benefits ("trade-offs") of alternative decommissioning methods for individual power reactors. This effort should make optimum use of data or methods developed in other relevant efforts. Proposals should identify appropriate sources of relevant information.

Milestones, Reports and Meetings	Weeks After Contract Award
Meet with Task Force to discuss objectives and approach	1
Present Phase 1 Results	
o Present report to Task Force on Tasks 1 and 2 (Task 3.1)(meeting)	5
o Provide draft report on Phase 1 (Task 3.2)	6
o Provide final camera-ready copy of Phase 1 report	8
Present Phase 2 Results	
o Provide draft report on detailed comparison of studies (Task 1.2)	16

o Provide draft report on sensitivity analysis (Task 3.4)(meeting)	20
o Provide draft report on regulatory impacts (Task 4.3)	20
o Provide draft report of detailed investigation (Task 5.1)	22
o Provide draft report of summary document (Task 5.2)(meeting)	22
o Provide camera-ready final report on Phase 2	24

Twenty (20) type written copies of each draft report are required. One (1) final report manuscript is required in camera-ready form.

Meetings between the contractor and the Task Force for reviews of the project and draft reports will be held on an as-needed basis. It is expected that three (3) such review meetings would occur during the course of the project.

Budget

Proposals for this study should be limited to a total of about twelve (12) man-months effort. For estimating contractor travel costs, it should be assumed that the review meetings will all be held in Washington, D. C. (This assumption is intended only for purposes of evaluating the costs, and is not itended as any locational bias.)

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July 10, 1980

Mr. Paul J. Pettit
Project Manager
Atomic Industrial Forum, Inc.
7101 Wisconsin Avenue
Washington, D.C. 20014

Dear Paul:

NATIONAL ENVIRONMENTAL STUDIES PROJECT
"NUCLEAR POWER REACTOR DECOMMISSIONING COSTS" STUDY

In accordance with the scope of work outlined in the original Request for Proposal for the "Nuclear Power Reactor Decommissioning Costs" study, Phase I required identification of all relevent (both domestic and foreign) technical studies of decommissioning alternatives which have been performed since 1976 and identification of relevant information presented in rate hearings and in congressional hearings on the subject which will be utilized in the comparative study aspect of this work. This information was to be provided in an initial meeting with the Task Force to be held within one week following contract award. The purpose of the meeting was to discuss the objectives and approach to these studies and to present to the Task Force a listing of those studies proposed for use in the evaluation.

In our telephone conversation July 3, 1980, you indicated that this initial meeting would not be required. We have, therefore, compiled a listing of those studies, which we propose to use in the Phase I analysis, of recent decommissioning studies and financial alternatives for your review and approval. We recognize that the list is not all inclusive in that there are studies that we have not received or may not be aware of at the present time which may prove of value to the study if received in the near future.

Additionally, we have solicited by letter from twenty-five State Public Utility Commissions for copies of any rate case hearings information which may be of value. The twenty-five States chosen are those in which commercial nuclear power plants are already in operation. At present, we have received responses from approximately 50 percent of those States solicited. We have also researched several Congressional hearings on the subject of decommissioning. The reports for these hearings have been requested and are expected to be received shortly.

The attached listings are our recommendation for the reports to be reviewed in Phase I. The review will not be limited necessarily to only those presented on the list if further investigation indicates that there are other reports which will also be useful. However, in order to restrict the study to the most pertinent technical studies on decommissioning and a reasonable representation of reports by utilities, State Public Utility Commissions, and Congressional hearings, we propose the attached bibliography.

If any additional information is required by the AIF or if you feel any other important studies should be added, please call me at (617) 973-7141 or Mr. Dave Greenwood at (617) 973-2072.

Very truly yours,

R. K. Westfahl
Project Manager

Enclosures

RKW:mt

REPORTS FOR PHASE I COMPARISON

Generic Reports	Specific Plant Studies
AIF/NESP 1976	San Onofre (PWR/W) Calif.
Battelle PWR 1978	NYSE&G (PWR/CE) N. Y.
Battelle BWR 1980?	Millstone 1 (BWR/GE) and Millstone 2 (PWR/CE) Conn.
Bechtel Comparison Study	Maine Yankee (PWR/CE) Me.
Jersey Central Comparison Study	Arkansas 1 (PWR/B&W) and Arkansas 2 (PWR/CE) Ark.
PENELEC Comparison Study	Monticello (BWR/GE) Minn.
IAEA-SM-234/46	Prairie Island 1 (PWR/W) and Prairie Island 2 (PWR/W) Minn.
Nuclear-Ingenieur-Service	Big Rock Pt (BWR/GE) Mich.
Candu PHW	Palisades (PWR/CE) Mich.

Rate Cases

Minnesota - Northern States Power - Monticello and Prairie Island

Michigan - Consumers Power Co. - Big Rock Pt. and Palisades

New Jersey - Jersey Central - Oyster Creek

Pennsylvania - Penn Electric - Three Mile Island 1 & 2

Ohio - Cincinnati Gas & Electric - Zimmer

Ohio - Cleveland Electric Illuminating Co. - Davis Besse 1&2

Arkansas - Arkansas Power & Light Co. - Arkansas Nuclear 1

Oregon - Portland General Electric - Trojan and Pebble Springs

New York - Consolidated Edison Company - Indian Point

California - Southern California Edison Company - San Onofre

BIBLIOGRAPHY RECOMMENDED FOR REVIEW FOR AIF STUDY

Technical Reports on Decommissioning (Generic)

1. W. J. Manion and T. S. LaGuardia, "An Engineering Evaluation of Nuclear Power Reactor Decommissioning Alternatives," AIF/NESP-009 Atomic Industrial Forum, Inc., November 1976.

2. R. I. Smith, et al, "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," NUREG/CR-0130, Battelle Pacific Northwest Laboratories, (1978).

3. R. I. Smith, et al, (?) "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station," NUREG/CR-0672, Battelle Pacific Northwest Laboratories, (1980?).

4. R. Bardtenschlager, et al, "Decommissioning of Light Water Reactor Nuclear Power Plants," Nuclear Engineering and Design, Vol. 45, pp 1-51, North-Holland Publishing Company, 1978.

5. "Review of Nuclear Power Reactor Decommissioning Alternatives," Bechtel National Inc., U.S. Dept. of Energy, October 1978.

6. G.N. Unsworth, "Decommissioning of the Candu-PHW Reactor," Whiteshell Nuclear Research Establishment, (April 1977). Reprint May 1979. (For Atomic Energy of Canada, Ltd.) AECL-5687.

7. "Decommissioning Procedures," excerpt from "Technology for Commercial Radioactive Waste Management," DOE/EI-0028 Vol. 4, Chapter 8, Pp 8.2.1-8.8.2.

Rate Cases

1. Public Service Commission - State of Minnesota - Testimony of T. S. LaGuardia on "Costs and Feasibility of Nuclear Plant Decommissioning"; and Testimony of B. J. Ewers, Jr., on "Financial Analysis of Nuclear Plant Decommissioning Costs" - Application of Northern States Power Co., May 1980.

1.A "Capital Recovery of Nuclear Plant Decommissioning Costs," submitted to Minnesota Public Service Commission - March 1980, by Northern States Power Co. - B. J. Ewers, Jr. (also includes "Attachment A - Computer Program Documentation").

2. Michigan Public Service Commission - Case U-6041 - Testimony by R. I. Smith, Battelle PNL; R. F. Brzezinski, Consumers Power Co.; and D. A. Bixel, Consumers Power Co. - March 1979.

3. Public Utilities Commission of Ohio - Application of Cincinnati Gas & Electric Co., et al, in Matter of Wm H. Zimmer Nuclear Power Station - incl. IOCs from OPUC.

4. Public Utilities Commission of Ohio - Application of Cleveland Electric Illuminating Company in Matter of Davis-Besse Unit 1. Testimony by L. O. Beck, C. C. Chopp, R. M. Kemper, W. J. Manion (including briefs and application data).

5. Public Utilities Commission of Arkansas - Application of Arkansas Power and Light Co. in matter of Arkansas Unit 1. Testimony by B. Douglas of Arkansas PUC, September 1979.

6. Public Utilities Commission of Oregon - Application of Portland General Electric Company in Matter of Trojan and Pebble Springs, March 1979.

7. Public Service Commission of New York - Application of Consolidated Edison Company of New York in matter of Indian Point, April 1979.

8. Public Utilities Commission State of California - Application of Southern California Edison Company in matter of San Onofre Unit 1, March 1980.

Congressional Hearings

1. "Technical and Economic Aspects of Nuclear Power Plant Decommissioning," Nuclear Energy Services, Inc., H 701-4.10, 1978.

2. "Decommissioning Costs," H 401-21, H 403-8, 1978.

3. Energy Department Decommissioning Programs, H 441-40.2, 1978.

4. ERDA Nuclear Facilities Decontamination and Decommissioning Programs, Fy 78 Authorization, S 311-29.2, 1978.

5. Decommissioned Reactors Radioactivity Problem, Article H 401-21.7, 1978.

6. Decommissioning Nuclear Reactors, Nuclear Regulatory Commission Requirements and Accepted Procedures, H 701-4.4, 1978.

7. Nuclear Power Plant Decommissioning Costs and Problems, H 401-21.8, 1978.

Technical Reports on Decommissioning of Specific Plants

1. "Decommissioning Study of NYSE&G Nuclear Plant Units 1 and 2," NES (T. S. LaGuardia and R. A. Calabrese) for New York State Electric and Gas Corp., June 1978.

2. "Decommissioning Study for Maine Yankee Atomic Power Station," prepared by NES for Stone & Webster Engineering Corp., April 1980 (Draft).

3. "Nuclear Power Plant Decommissioning Study for Northeast Utilities," Northeast Utilities Service Co. (L. H. Levy), November 1976.

4. "Nuclear Power Plant Decommissioning Study for Millstone Units Nos. 1 and 2," Northeast Utilities Service Co., September 1979 (L. Levy).

5. "Analysis of Decommissioning Arkansas Nuclear One (Units 1&2)," Arkansas Power & Light Co., October 1977.

6. "San Onofre Nuclear Generating Station Decommissioning Alternatives," NUS Corp. (R. J. Stouky and E. J. Ricer), prepared for Southern California Edison Co., February 1977.

7. "Decommissioning Costs - San Onofre Nuclear Generating Station Unit 1," NUS Corp. for Southern California Edison Co., October 1979.

8. "Decommissioning Study of the Monticello Nuclear Generating Plant," Rev. 1, prepared for Northern States Power Company by Nuclear Energy Services, September 1979.

9. "Decommissioning Study of Prairie Island Nuclear Generating Plant, Units 1 and 2," Rev. 1, prepared for Northern States Power Company by Nuclear Energy Services, September 1979.

10. "A Nuclear Power Plant Decommissioning Study," Consumers Power Company (Nuclear Plant Decommissioning Task Force) (Report on Big Rock Point and Palisades Nuclear Plants), November 1978.

11. "JCP&L Decommissioning Study Comparison to AIF Decommissioning Study," Draft including estimates for Oyster Creek Unit 1 and Three Mile Island Units 1 and 2 Jersey Central Power and Light and Pennsylvania Electric Co.

12. "PENELEC Decommissioning Study Comparison to AIF Decommissioning Study" (See 11 above).

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G. D. CALKINS

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Subject: Decommissioning/Light Water Reactors