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NUCLEAR MANAGEMENT AND RESOURCES COUNCIL

1776 Eye Street, N.W. • Suite 300 • Washington, DC 20006-3706
(202) 872-1280

Thomas E. Tipton
Vice President & Director
Operations, Management and
Support Services Division

G. Mencinsky
58FR54385
10/21/94
(8)

Mr. David L. Meyer, Chief
Rules Review and Directives Branch
Division of Freedom of Information
and Publication Services
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: U.S. Nuclear Regulatory Commission draft NUREG/CR-5884, "Revised Analyses of Decommissioning for the Reference Pressurized Water Reactor Power Station," and draft NUREG/CR-6054, "Estimating Pressurized Water Reactor Decommissioning Costs"
58 *Federal Register* 54385 (October 21, 1993) Request for Comments

Dear Mr. Meyer:

These comments are submitted on behalf of the nuclear power industry, by the Nuclear Management and Resources Council, Inc. (NUMARC)[1], in response to the U.S. Nuclear Regulatory Commission's (NRC) request for comments (58 Fed. Reg. 54385, October 21, 1993) on draft NUREG/CR-5884, "Revised Analyses of Decommissioning for the Reference Pressurized Water Reactor Power Station," Volumes 1 and 2 and on draft NUREG/CR-6054, "Estimating Pressurized Water Reactor Decommissioning Costs."

The industry supports the NRC's public decommissioning funding reevaluation process. We appreciate the extension of the public comment period from December 31, 1993, to February 15, 1994. This extension aids the reevaluation by permitting sufficient time to review and analyze the draft methodology and to consider its practical application for NRC required funding.

[1] NUMARC is the organization of the nuclear power industry that is responsible for coordinating the combined efforts of all utilities licensed by the NRC to construct or operate nuclear power plants, and of other nuclear industry organizations, in all matters involving generic regulatory policy issues and on the regulatory aspects of generic operational and technical issues affecting the nuclear power industry. Every utility responsible for constructing or operating a commercial nuclear power plant in the United States is a member of NUMARC. In addition, NUMARC's members include major architect/engineering firms and all of the major nuclear steam supply system vendors.

The industry recognizes its responsibility to develop a general level of adequate financial funding for decommissioning that will assure sufficient funds are available at the time they are needed to decommission the facility in a manner which protects public health and safety.

Considerable experience has been obtained since promulgation of the final rule, "General Requirements for Decommissioning for Nuclear Facilities," 10 CFR Parts 30, 40, 50, 51, 70, and 72 on June 27, 1988 (53 Fed. Reg. 24018). The nuclear power industry's review incorporates the experiences gained by actually collecting and managing decommissioning funds during the operating life of licenses, and the actual plant specific experience of prematurely shutdown facilities. Industry experience in this area also includes the extensive guidance and requirements regarding decommissioning funding that is associated with state rate regulatory oversight.

We used this experience as the basis for this industry review which addressed not only the draft NUREG/CRs, which reevaluate the current assessment of costs required to decommission the reference Pressure Water Reactor (PWR), but also the regulatory (10CFR50.75(c)) decommissioning funding requirements, for possible improvements. We believe many of our comments also generally apply to boiling water reactor (BWR) decommissioning cost considerations. NUMARC will comment specifically on BWRs when noticed for public comment.

Regarding decommissioning funding regulatory requirements, implementation of the current rule has demonstrated substantial difficulties are associated with that rule. The principal difficulties are: the rule inaccurately reflects the approximate current cost of decommissioning a PWR to achieve license termination; it lacks appropriate flexibility to accommodate the variability in decommissioning costs that plant specific experience has demonstrated; the rule inappropriately requires the total fund be accumulated by end of operating life rather than requiring necessary funds be accumulated by the time they are to be expended for decommissioning activities; and it fails to properly locate its detailed, recurring features in regulatory guidance, instead of in the rule.

The general approach of the current rule is appropriate, but it should employ a corrected model decommissioning estimate, proper flexibility for specific estimates, more appropriate time requirements for fund availability, and more appropriate use of regulatory guidance. Based on experience, an efficient way to address sufficient funding assurance regulation is by use of a model to establish a general level of adequate funding which is periodically adjusted on a regional basis. This avoids the inefficiency that

would be associated with requiring more detailed cost analyses long before anticipated decommissioning to satisfy the purpose of achieving a general level of sufficient funding. Enclosure 1 of this correspondence provides recommendations for developing more appropriate NRC regulation for decommissioning funding.

More specifically, regarding the first principal difficulty, inaccuracy in the current cost estimate - a basic assumption behind NRC's 1988 rule was that cost estimates for a reference plant could and would be typical of decommissioning costs for the entire industry. Experience has demonstrated that the original assumption is not valid. A proper model estimate, however, can be used to help determine an appropriate general indicator of sufficient funding for use in the regulation. The model estimate should be based on sound reference plant calculations in combination with other available empirical data regarding decommissioning costs.

A necessary step to developing a valid model decommissioning cost estimate is correction of the methodological oversights and errors in the draft NUREG/CR-5884 to achieve a more accurate estimate for the reference plant. Detailed comments in Enclosure 2 provide many suggestions for improving this methodology. We have developed these in part based on comparing the draft NUREG with the detailed cost estimates that Portland General Electric Company has developed for actually decommissioning the Trojan Nuclear Plant.

Regarding the second difficulty identified above, the lack of appropriate flexibility in the current rule - the current regulation concentrates on the reference plant estimate and fails to adequately recognize that decommissioning cost estimates are sensitive to a wide range of plant specifics. Use of a model estimate to draw conclusions regarding other unit-specific estimates must be done carefully and must accommodate this variability. There is no provision in the rule for relief from the rule's funding requirements, which are based on estimates for the reference plant. If relief is warranted because a unit-specific detailed cost analysis demonstrates the rule's requirements are excessive for that unit, an exemption proceeding must be pursued. This is an unwarranted regulatory burden that should be corrected by adding a provision to permit licensees to use unit-specific sufficient funding values under appropriate conditions.

Timing of funds accumulation is the third principal difficulty - the regulation requires that the decommissioning fund must contain all of the money needed to pay for the required activities at the time termination of operation is expected. This is inappropriate because the money will not be needed to pay for decommissioning activities until such time as these various activities are performed during the life of the

decommissioning project. These expenditures will be spaced over several years at a minimum. Invested moneys not expended will continue to grow during this time. It is an unnecessary economic burden on licensees to require availability at the time the plant ceases operation of all of the money that will eventually be needed. At that milestone the fund need only contain an amount that will reasonably assure sufficient fund availability to cover the cost of activities required for license termination at the time the licensee anticipates the activities will be conducted.

The final principal difficulty with the current rule is the placement of detailed, recurring features in the regulation - the detailed formula for the annual adjustment of the general estimate of sufficient funding as it applies to each plant should be removed from the rule and placed in Regulatory Guide 1.159 where the methodology for its use is detailed. This formula relates regional changes in several decommissioning cost categories to the model cost estimate used as the basis. This level of detail is more appropriate and better handled in a regulatory guide, rather than in a regulation.

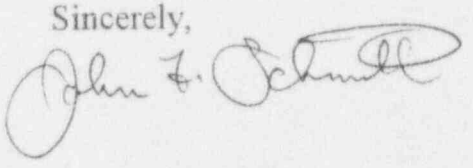
The decommissioning funding regulations should be revised to reflect actual experience gained with decommissioning funding. At the same time, NRC decommissioning funding requirements should be limited to providing "[r]easonable assurance that the Commission's objective is met, namely that at the time of permanent end of operations sufficient funds are available to decommission the facility in a manner which protects public health and safety" (NUREG-1221). Additional decommissioning funding activities beyond that purpose are properly the responsibility and the prerogative of licensees and, in some matters, that of their financial regulators. Since such rulemaking affects both PWR and BWR cost estimates, the NRC should use the full benefit of public comments on both draft cost analyses before developing any proposed changes to funding regulations.

If the NRC's decommissioning funding requirements are changed, they should continue to recognize the propriety of existing funding assurances for spent nuclear fuel and for decommissioning activities beyond those needed for license termination. The Nuclear Waste Policy Act mandates a trust fund for disposal of spent fuel which nuclear utilities have been funding. Duplicative requirements must be avoided; making the rate payer pay twice is inappropriate. Also, decommissioning activities not required for license termination, that is not involving materials that are above the site cleanup criteria, are outside the NRC's responsibility. Funding requirements for these activities must not be included in NRC rules.

In summary, NUMARC encourages the NRC to reconsider the decommissioning funding process to incorporate reasonable funding requirements based on actual data, to properly utilize regulatory guidance to address methodology details, to properly relate the timing required to the performance of decommissioning activities, and to provide sufficient flexibility so as not to impact rate payers unnecessarily. This will help assure that sufficient funds are available to decommission the facility in a manner that protects public health and safety.

If we can be of any assistance to you as you consider our comments, please contact Alan Nelson, John Schmitt, or me.

Sincerely,



for Thomas E. Tipton

TET/APN:slr
Enclosures

COMMENTS ON DECOMMISSIONING FUNDING REGULATORY REQUIREMENTS

Industry experience since the implementation of the decommissioning funding requirements has demonstrated substantial difficulties are associated with the rule. Decommissioning funding experience includes utility use of the substantial amount of guidance and requirements regarding decommissioning funding associated with state financial regulatory oversight. We have combined that experience with insights from our review of draft NUREG/CR-5884 and NUREG/CR-6054 to develop these recommendations for improvement of NRC's decommissioning funding regulations.

Careful consideration must be employed when utilizing a reference plant to draw conclusions regarding decommissioning costs at other plants. A major conclusion of the industry's review of draft NUREG/CR-5884, is that the Trojan Nuclear Plant in Oregon (the reference plant) is not typical for PWR decommissioning cost estimates. The report recognizes that the largest impact on the decommissioning cost is the decommissioning option chosen -- DECON, SAFSTOR, or ENTOMB -- but fails to adequately include many of the variables that can significantly affect cost estimates, such as: different plant characteristics; site location; site size; internal size of containment; constraints to cutting, removing, and packaging large components; work sequence effects of the location of the spent fuel pool; site radiological characterization; plant operating experience; decommissioning project schedule; and sufficient staff to complete the decommissioning project. These factors can account for differences of tens of millions of dollars in the estimates of decommissioning costs of similarly sized power reactors. Another substantial financial impact within NRC's authority is that of the radiological criteria for site cleanup that will ultimately allow license termination.

We recommend that these limitations of the estimates in draft NUREG/CR-5884 be recognized. Experience with actual decommissioning cost estimates reinforces this point. We believe that a model decommissioning cost estimate that includes a reference plant can be used, however, to develop an appropriate regulation. This model estimate could help determine an appropriate general indicator of sufficient funding to adequately protect public health and safety during decommissioning. Before incorporating estimates in the draft report into this model, many methodological oversights and errors detailed in Enclosure 2 must be corrected so the reference plant estimate will be valid. In addition, in using the model estimate to develop a general indicator of adequate funding, appropriate flexibility must be included to account for plant variability.

Information including model decommissioning cost estimate should replace the current use of the reference plant as the basis for the sufficient fund value in

10CFR50.75(c)(1)(i). The model estimate should be developed utilizing as input: (1) the reference plant (Trojan) estimate, corrected based on our comments provided in Enclosure 2; (2) empirical data available from operating plant activities, such as cleanups and steam generator removals; and (3) empirical data from prematurely shutdown nuclear power plants where actual decommissioning planning and decommissioning activities have been performed. The Trojan estimates in the draft report can be significantly improved by considering the actual cost estimates developed by Portland General Electric Company as they work to engineer, schedule and accomplish a safe and effective decommissioning of the plant originally chosen as the reference plant.

Use of a model decommissioning cost estimate that uses actual data for the reference plant and that goes beyond the reference plant to incorporate other empirical data now available would be a valuable improvement over the reference plant basis of the current 10CFR50.75(c)(1)(i). It would utilize the relatively recent experiences at several large power reactors to address the limitations of the original reference plant study. In discussing difficulties with decommissioning cost estimates, SECY-91-164 stated, "[c]urrently there are no empirical data on the actual costs for decommissioning large power reactors. All decommissioning cost estimates are based on interpretation and extrapolation of data from decommissioning small reactors or non-reactor facilities, and data from cleanup, maintenance, and repair of operating plants." Considerably more data now exists and should be utilized.

The rule requires that funding estimates be reviewed annually for both PWRs and BWRs (50.75(1)(i), and 50.75(1)(ii)) utilizing adjustment factors in 10CFR50.75(2). Adjustments to contributions to the fund should be made periodically over the life of the facility (50.75(d)), and that the total amount be accumulated at the time termination of operations is expected (50.75(e)(1)(ii). Since all the funds are not necessary at the time of termination of operations, only reasonable funding should be required. The rule should reflect this more appropriate timing.

Periodic adjustment of the general estimate of sufficient funding as it applies to each unit should continue to be performed according to a formula that relates regional changes in several decommissioning cost categories, i.e., energy, labor, and low-level waste disposal, to the model cost estimate used as the basis. This formula and methodology, currently in 10CFR50.75(c)(2), should be placed solely in Section 1.2 of Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors." This level of detail is more appropriate to a regulatory guide than it is to regulation. In applying specified fixed multipliers in the adjustment factor formula, it should be recognized that these are valid only for making adjustments relative to the reference plant basis. The actual proportions of decommissioning funds estimated to be

spent on each of these cost categories to DECON a particular plant, if that is the decommissioning option the licensee elects, is reflected in draft NUREG/CR-5884 Figure ES.1, "Variation of DECON Escalation Formula Terms as Functions of Low-Level Waste Disposal Charge Rates."

No additional reporting requirements regarding periodic adjustment of the fund are appropriate. These records are available under current requirements for NRC inspection, and rate regulation, including these funds, is a matter of public record. Adding a regulatory requirement for additional reporting of this available information would be a regulatory burden not commensurate with any safety benefit, and would be counter to the intent underlying the Paperwork Reduction Act.

The decommissioning funding regulations should contain a provision at 10CFR50.75(b) to permit a licensee to use a unit-specific sufficient funding value that is less than the model estimate incorporated in the revised regulation under certain conditions that assure appropriateness of the value to achieve the purpose of the regulation. The funding value would need to be developed using generally accepted estimating methods, and the value would need to provide sufficient funds at the time they are needed to decommission the facility in a manner that protects public health and safety. Such a provision would be consistent with Section 1.1.1 of Regulatory Guide 1.159 which currently provides for licensee establishment of unique power reactor funding values without requiring an exemption process.

This feature is recommended to improve the current regulation which, due to the absence of this appropriate flexibility, requires a regulation exemption to address this situation. This exemption requirement imposes an unnecessary regulatory burden and goes beyond what is needed to assure a general level of sufficient funding.

In summary, the industry recommends upgrading the current decommissioning funding regulations in a way that will continue to provide reasonable assurance of adequate protection of public health and safety for decommissioning activities. This can be done in an efficient manner by revising the required minimum funding value in the regulation to reflect input from an improved decommissioning cost estimate that incorporates the corrected reference plant estimate and other empirical data now available. The draft estimate for the reference plant should be revised taking into consideration our comments in Enclosure 2 to more accurately reflect the current costs of decommissioning to achieve license termination. The requirements regarding timing of full funds availability should be based on when funds are needed for decommissioning, rather than other milestones such as end of operating life. Periodic adjustments should be performed on a unit-specific basis using a formula to be detailed in a revised Regulatory

Guide 1.159. Reporting requirements beyond those in the current regulation would be unnecessary and inappropriate. The regulation should include provision for a unit-specific variation from the rule where conditions are met that assure the value estimated would protect public health and safety in decommissioning the unit. This feature is appropriate due to the variability of decommissioning costs among plants that actual experience has demonstrated. Any rulemaking in this area should only be done after fully considering the public comments on both the PWR and BWR draft revised cost estimates.

COMMENTS ON DECOMMISSIONING FUNDING COST ESTIMATES AND METHODOLOGY

Part I General Comments on draft NUREG/CR-5884

Since the initiation of NRC's contract with Pacific Northwest Laboratories (PNL), the Trojan Nuclear Plant prematurely shutdown on January 27, 1993; detailed actual cost estimates for decommissioning have been developed by Portland General Electric Company (PGE). Industry comparison of draft NUREG/CR-5884 methodology and PGE's cost estimates, based on empirical data of actual decommissioning activities, has identified numerous methodology inaccuracies in the draft NUREG that should be corrected in order to reach realistic cost estimates. Also, the absence of a complete methodology causes the current draft NUREG/CR-5884 to be technically incorrect.

Decommissioning strategies and their attendant costs require many inputs and assumptions. Each of these parameters has uncertainty associated with it and the levels of uncertainty vary significantly among the various parameters. Additionally, each nuclear facility represents a unique situation with respect to size, location, single- versus multi-unit site, years of operation, etc. Thus, the report should only be considered as a guide and its conclusions and decommissioning cost estimate recognized as only applicable to the special case that it represents. Any use beyond that must be done with caution, recognizing the significant variability among plants. The draft report requires correction to achieve a valid estimate for the reference plant it uses and to help its methodology to become "generically" correct.

The final NUREG/CR-5884 should provide a cautionary statement regarding its use. This cautionary statement should be included in the executive summary and at the beginning of the report. The statement should make the following three points:

- The report is to be used as a guide and not as a "benchmark" for estimating the decommissioning costs associated with other facilities;

- The conclusions and decommissioning costs reported in draft NUREG/CR-5884 are specific to the reference PWR for the scenarios analyzed. They do not represent the conclusions and decommissioning costs which have been or could be obtained for an actual facility, including the Trojan Nuclear Plant which serves as the reference PWR in the report; and

- The cost estimates may vary significantly based on disposal costs. This is illustrated in Figure ES.1 "Variation of DECON Escalation Formula Terms as Functions of Low-Level Waste Disposal Change Rates."

The methodology in the report should only be based on constant dollars and refrain from any economic predictions. This will preclude faulty economic predictions from skewing report results and, perhaps incorrectly, making one decommissioning option look better than another. Financial predictions are not within the NRC's expertise or primary responsibilities. Users of the report can then judge for themselves the impact of real world economics in relation to the published decommissioning options.

The NRC should not make any reference to demolition cost estimates that are speculative and the responsibility of State Rate Commissions. The report should delete assumptions that demolition costs can be estimated as high as $100 million; the NRC has no jurisdiction over these funds.

The underlying assumptions regarding decommissioning manpower management are not clearly stated in the report. The use of crew-hours as a resource measure is confusing and misleading. Additionally, the basic work philosophy is not readily apparent. Shift length, shifts per workday, and workdays per week need to be clearly stated in the beginning of the report. For example, the report has decommissioning activities which rely on a three shift operation, such as internals removal. Obviously, the work-schedule approach directly affects period dependent costs and may affect activity dependent costs as pointed out below.

In draft NUREG/CR-5884, reactor vessel internals removal is a three shift operation, with two cutting crews on each of two shifts and packaging and disposal occurring on the third. This may be too optimistic and current decommissioning experience questions the practicality of running simultaneous cutting operations. The assumption that four cutting-crews' worth of disposal can be accomplished on the backshift appears to be overly optimistic. Also, cask availability, which is a determining factor, is not addressed. Although there is sufficient room available for two cutting operations at the reference PWR, this may not be the case at other facilities.

There seem to be some conflicts in the deactivation (Period 2) schedule. Three activities overlap: deboration of the reactor containment system (RCS) water, RCS chemical decontamination/flushing, and reactor pressure vessel internals removal, cutting, and packaging. The ability to perform these activities in parallel is questionable. The report needs to better explain the sequence of these activities.

Assumptions used in the development of unit cost factors may be unrealistic. For example, the unit cost factors for pipe removal were developed on the basis of removing 15-foot lengths of pipe per cut, which appears to be extremely unrealistic. Using this value, the number of piping cuts required will be significantly underestimated. Moreover, use of the 15-foot lengths in the report gives a false impression that it is readily achievable. It would be better to base piping removal costs on 5-foot lengths; achieving an average cut longer than that would result in cost savings. Additionally, consider the handling requirement differences between a 5- and 15-foot section of pipe. A 24-inch Schedule 160 pipe weighs 542 lbs./ft. It is much easier to handle and maneuver a 5-foot piece weighing 2700 lbs. as opposed to a 15-foot piece weighing 8100 lbs. Use of 15-foot sections of pipe is judged to be unattainable due to plant layout and actual access and egress within the reference plant. Calculating pipe removal costs assuming 15-foot lengths is not representative of actual experience.

The draft NUREG/CR-5884 reported costs (without contingency) of reactor internals and reactor pressure vessel removal appear to be very low when compared to actual (PGE) estimated costs for removing these items. Many factors determine the overall removal cost for these items, with transportation and burial costs being the predominant factors.

Asbestos removal can be a significant decommissioning cost. The report assumes an insignificant amount of asbestos is present in the reference plant at the time of decommissioning. This assumption cannot be generally applied to all PWRs.

The draft NUREG/CR-5884 use of only Co60 underestimates the amount of contamination to be removed from the site to be in compliance with NRC requirements. As a result, the associated decontamination, removal, and burial costs will also be underestimated. By not including a more valid isotopic inventory, including Beta emitters, the work schedule is underestimated leading to lower staff requirements and undistributed costs.

The report did not include costs for site characterization studies. These extensive efforts include isotopic analyses and surveys to clearly define isotopic contents and the scope of required decommissioning activities. Site characterization costs should be included in the final document.

There are multiple waste volume estimation errors. The draft NUREG/CR-5884 low-level waste volume is underestimated by neglecting to include 77,000 cubic feet of electrical components (cable, trays, conduit, panels, and breakers). The report does not consider state of the art decontamination volume reduction techniques. The analysis does

not consider waste volume minimization technology during decommissioning. Incineration, metal recycling, reverse osmosis, iceblasting for decontamination are among the methods that can be used to reduce the low-level waste disposal volume. The report assumes the entire turbine building is uncontaminated and neglects some systems that have contamination, e.g., instruments in containment. The study uses packing factors higher than recent industry experience. It assumes that pipe supports are not significant in terms of waste volume. This is a non-conservative assumption as most of the contaminated systems are safety related. Safety related systems have far more and larger supports, to meet Seismic Category I requirements, than balance of plant systems. Large supports also present special rigging concerns.

The study estimate for scaffolding and rigging factors does not account for working in overhead areas, pipe chases and shielded rooms where a significant portion of the contaminated components are located.

The study included the payroll burden in the staff costs, but did not include corporate indirect costs. Corporate support staff costs should be allocated to the decommissioning project. The payroll salaries for both utility staff and the decommissioning operations contractor were considered low for the Pacific Northwest.

The cost identified for the final license termination survey is underestimated by a factor of 5 to 10 based on actual industry experience from prematurely shut down plants.

COMMENTS ON DECOMMISSIONING FUNDING COST ESTIMATES AND METHODOLOGY

Part II Specific Comments on draft NUREG/CR-5884

Executive Summary Page xvi second bullet	Title 10 CFR 961, Appendix E, requires a five-year Spent Nuclear Fuel (SNF) cooling for delivery to DOE for shipment as "Standard Fuel," not for storage in spent fuel pools prior to dry cask storage. Interim SNF placement in dry cask storage cells is limited by the heat removal capability of the cask design, which could be less than five years. The draft should be revised to recognize alternative methods of storing spent fuel.
Page xvii, xviii, and 2.5	Draft NUREG/CR-5884 use of only Co60 underestimates the amount of contamination to be removed from the site to comply with NRC requirements. The associated decontamination, removal and burial costs will also be underestimated. The underestimation of radioactivity leads to underestimated work schedules which cause incorrect estimates of staff and undistributed costs. Use of Co60 effects the assumptions used in SAFSTOR1 and ENTOMB1, where all activity (other than the reactor vessel and the biological shield wall) has decayed to unrestricted release levels by the end of the storage period. Among the contaminants at Trojan, Ni59 and Ni63 have half-lives which are much longer than Co60.
Page xvii-xviii second bullet, SAFSTOR second paragraph	SAFSTOR 1 assumes that all radioactive material except the pressure vessel and bioshield decay to unrestricted release levels. SAFSTOR 2 assumes no volume reduction. More probable and realistic assumptions should be used such as state of the art decontamination and volume reduction techniques.

Part II Specific Comments
Cont'd.

Page xix
Table ES.1

Table ES.1 should present the expected decommissioning costs for entombment using the reduced or more realistic security and insurance costs; i.e., the table should reflect the $88 million dollar figure on page 5.13.

Table ES.1 should list the costs of various alternatives assuming disposal at Barnwell instead of Hanford. There is currently a factor of 4.5 difference between Hanford and Barnwell. By not providing the range, the reader may draw the wrong conclusions regarding the range of costs associated with DECON, SAFSTOR, and ENTOMB.

The final NUREG/CR should recognize that Barnwell may not be available to out-of-compact generators after June 1994 and the charges at Barnwell do not represent the true cost of waste disposal, but rather the charges include substantial surcharges.

Page xxi
Table ES.2

For entombment, costs should be adjusted for the transportation and disposal associated with the long lived Nb95 and Ni59 activity.

Page xxiv, and
Volume II C.45

Draft NUREG/CR-5884 estimates the use of scaffolding and rigging factors that do not account for working in overhead areas, pipe chases and shielded rooms where a significant portion of the contaminated components are located.

Draft NUREG/CR-5884 assumes that all piping is removed in 15-foot sections. A 15-foot section of schedule 80 pipe weighs 1591 lbs. while a 5-foot section of schedule 80 pipe weighs 530 lbs. Rigging a 15-foot section of RHR piping out of a shielded compartment and up a 40-foot hoistway to get to grade level would involve significant rigging challenges.

1.0 Introduction
1.1 Major Factors Considered
Page 1.2-1.3

The NUREG/CR should acknowledge that there are costs associated with structure demolition and site restoration which are in addition to the necessary cost to achieve termination of the license, but should not speculate on those additional costs; such speculation should be deleted.

Part II Specific Comments
Cont'd.

Page 1.3, fifth line from top of page	The line implies that non-nuclear demolition and the on-site storage of retired steam generators could add $100 million or more to the decommissioning cost. The statement should either be removed, or should be expanded to differentiate between the added cost of non-nuclear demolition and that of individual items such as steam generators. The reader should not be left with the impression that a large percentage of the $100 million dollars is attributable to such things as "retired steam generators" removal from the site.
Approach, Bases, and Assumptions 2.1 Study Approach Page 2.2 last two paragraphs	The scheduling constraint on operation of the spent fuel pools following plant shutdown is directly related to the heat removal capability of the cask design. The text should recognize that some designs employ passive cooling techniques to increase the heat removal capability and reduce the time required for cooling in the spent fuel pools (i.e., less than five years).
Page 2.3 first paragraph	The assumption that 90 percent of spent nuclear fuel (SNF) storage cost is assigned to plant operations and 10 percent assigned to decommissioning SAFSTOR should be reconsidered. The assumption is based on the premise that DOE will accept SNF by 1998. This seems optimistic. Therefore, the cost ratio for SNF storage cost should be reevaluated.
2.2. Study Bases and Assumptions Page 2.5, sixth bullet	The radiation dose rate should be calculated using an effective dose factor for an assumed mix of radionuclides instead of being determined based solely on the short half-lived Co60.
Page 2.6 third and fourth bullet	The NUREG/CR states that a basic assumption is that an off-site low-level waste disposal site exists and will accept the waste. This may be a misleading statement as a utility might elect and obtain approval to do significant decommissioning work with the intention of storing the waste on the site pending off-site shipment. As an example, the licensee might find it cost-effective to section, remove and package the reactor internals for storage while the necessary plant systems are physically operable and the staff is available to support the operations, independent of disposal site availability. The NUREG/CR should recognize such alternative approaches.

Page 2.6 fifth bullet	It is not technically correct to assume that "contaminated" (not irradiated) concrete must be removed to a depth of 1 inch. Typically available decontamination methodologies exist that will clean painted concrete surfaces with essentially no concrete removal, and methods of very shallow surface removal (far less than 1 inch) have been demonstrated. The NUREG/CR should be corrected.
Page 2.7 first bullet	The removal of asbestos is an attendant and essential part of decommissioning. Many plants have active asbestos removal programs as implied on page 2.7. The NUREG/CR should recognize that the costing of asbestos removal is most appropriately performed on a plant- or case-specific basis.
3.0 DECON for the Reference PWR Page 3.1 fourth sentence	Indicates "fuel from last core is postulated to have to remain in the pool for about seven years after shutdown until it is sufficiently cooled to permit dry storage..." Previously it was indicated that five years was the minimum time for decay before transferal to DOE, and that transfer to dry cask storage can be achieved earlier (See comment regarding P.xvi, and P.2.2.)
Table 3.1 Page 3.3	The analysis should consider waste volume minimization technology during decommissioning. Incineration, metal recycling, reverse osmosis, ice blasting for decon, etc., are means to reduce the burial volume of radioactive waste. Rather than consider these options as potential savings at the time of decommissioning or case-by-case economic decisions for the future, it is realistic to include them as a variable or potential error in radioactive waste disposal costs. Based on the estimates in Table 3.1, decon and disposal costs constitute greater than 30% of the total cost without contingency.

3.1 Pre-Decommissioning and Planning, Period 1, General

The correlation between the staffing level tables in person-years per period and figures providing staffing levels during comparable periods are confusing and not human-factored. The comparison figures and tables should be reevaluated in order to provide the reader with a clear understanding of Decommissioning Operations Contractor (DOC) and utility staffing levels.

The staffing estimates provided in draft NUREG/CR should be reevaluated. The staffing levels identified in the revised analyses are considered insufficient. In Period 1, there should be more involvement of the lower level positions, particularly, there should be significant involvement from licensing personnel. In Period 2, the levels are too low to perform all the required activities (i.e., defueling, training, DECON, surveillance, etc.).

In Period 3, the levels identified are too low. For example, one decommissioning utility required 104 equivalent persons for this stage versus the 53 identified by the Decommissioning Operations Contractor (DOC.) The basis for not using utility personnel should be provided. Also in Period 4, when the DOC staff has been mobilized, it is indicated that additional utility staff is returned to the site to support the active decontamination and dismantlement. This is not a good assumption. It should be expected that a large part of the utility staff would either leave the utility or be placed elsewhere in the company. If these people were placed elsewhere in the company, it is unreasonable to assume that they could all be brought back without adversely impacting their new organizations' operations. Returning these people to the site during Period 4 should not be assumed. A basis should be developed to support staffing level requirements. Staffing as presented did not include corporate overhead or the quality assurance activities.

Page 3.20, 3.21, 3.22, Volume II C.33, C.39, C.35, and C.45

The draft NUREG/CR-5884 cost estimate omitted contaminated electrical components (cable, trays, conduit, panels and breakers). The study assumes that pipe supports are not significant in terms of waste volume. The study also omits some contaminated systems and piping.

The contaminated electrical components included in the Trojan estimate prepared by Portland General Electric represents 77,000 cubic feet of LLW. The insulation on cables in contaminated overhead areas and contaminated electrical motor windings can not be decontaminated. Most of the contaminated systems are safety related. Safety related systems have far more and larger supports, to meet Seismic Category I requirements, than Balance of Plant systems. Large supports also present special rigging and packaging concerns. The linear feet of stainless steel pipe used in the draft NUREG/CR-5884 estimate is approximately 48,000 feet. The linear feet of stainless steel pipe calculated, based on Trojan drawings, is estimated at more than 55,000 ft. Carbon steel pipe used in systems like Instrument and Service Air inside containment is not included. (PGE estimate is 56,000 cubic feet.)

3.5.2 Impact of the Time Value of Money
Page 3.59

The final NUREG/CR should base its funding calculations on constant dollars and avoid any economic predictions on discount rate.

Requiring 100 percent of the estimate on the last day of operation in constant dollars provides excessive conservatism. This is especially so when a 25 percent contingency is used.

In use, the methodology should accept other time value of money considerations at licensees discretion.

Volume II C.30, Table C.4

The cost identified for the final survey is underestimated based on actual industry experience. The cost of PGE's Trojan License Termination Survey is consistent with other plants currently prematurely shut down. The cost of the Trojan Licensing Termination Survey is estimated as follows:

Radiation Protection Supervisor	1	$68,000
Radiation Protection Technicians	29	$1,305,000
Craft Labor	20	$1,160,000
Total salary (including payroll burden at 27%)		$2,533,000
Corporate Indirect Costs		$2,500,000
Total annual cost of Licensing Termination Survey		$5,033,000
Duration of Licensing Termination Survey	15 months (1.25 yr)	
Total cost of Licensing Termination Survey	$5,033,000 x 1.25 = $6,291,000	

Page E.20, E.23, E.24, and E.25

Draft NUREG/CR-5884 assumes packing efficiencies of 60-90% for packaging the reactor vessel internals. The NUREG/CR-5884 should recognize decommissioning data now available.

During the current removal of reactor vessel internals at a prematurely shut down plant, the packing efficiency achieved is between 30% and 35%. In the case of the reactor vessel, the draft NUREG estimate for removal and burial is $1.2 million versus $10.7 million in the PGE estimate. Adjusting the draft NUREG/CR-5884 estimate for the Trojan packing factors of 25% and greater than Class C burial rates gives a cost of $13.3 million.

COMMENTS ON DECOMMISSIONING FUNDING COST ESTIMATES AND METHODOLOGY

Part III General Comments on draft NUREG/CR-6054

Industry review raised the question of the usefulness of the program in NUREG/CR-6054 to determine the validity of cost estimates submitted five years before projected end of operation. If the program is determined by NRC to be worth further developing because it is judged useful, the user's manual for the PWR cost estimating computer program (CECP) and the software should be revised to ensure compatibility with the final NUREG/CR-5884 Volume 1 and 2.

There should be a section for each data entry screen, which describes each data entry parameter and how it is used by the CECP (e.g., menu item A of the CECP asks for site size, apparently using this figure to calculate taxes for a specific plant based on site acreage; menu item H asks for Property Taxes ($/year) for each period. NUREG/CR-5884, Volume 2, Section B.9.2 describes property tax calculation assumptions, but it is not clear how the site size is used in the CECP.) It may be appropriate to incorporate Section C from NUREG/CR-5884 into this NUREG.

The user should be able to back directly out using the Alt-X combination (or preferably just Esc) when viewing an input file (and not changing data) without having to go through the "Save Data to a File" box.

The program should provide for an automatic update of all files necessary to reflect changes to input parameters. Currently only some files are updated automatically, but files related to decommissioning periods and overhead staffing must be updated manually before calculating final cost.

The schedule start dates for periods after Period 1 should be automatically input by the CECP, since this date is by definition the same as the end date for the previous period.—

Pressing enter for an entry sometimes gives a blank, and other times gives an editable line. For convenience, it would be better if the line were always editable.

Since staffing is the largest single cost contributor, it may be useful to allow for different overhead values for subsets of utility and DOC staff, such as administrative and general labor.

Part III General Comments
Cont'd.

On page 4.31 (line 5) there is a typo: "N" should be "D".

Line items listed as "Other" in the printout of *.PRG files are listed as "DOC" in the summary line. This is correctly addressed in *.PRI files.

Input screen *.PRE and file *.PDE show volume and weight in opposite order. It would facilitate review if they were consistent.

Files *.PDA, *.PDD, *.PDE, and *.PDG may not be read in DOS. It would facilitate review and documentation if they were ASCII text files.

The draft NUREG/CR-6054 does not provide the user instructions on how to print out the results. A section should be developed that provides instructions for printing.