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ENCLOSURE 4

NUREG-1440

REGULATORY ANALYSIS FOR PROPOSED AMENDMENTS TO REGULATIONS FOR THE ENVIRONMENTAL REVIEW FOR RENEWAL OF NUCLEAR POWER PLANT OPERATING LICENSES: DRAFT FOR COMMENT

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U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research

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ABSTRACT

This regulatory analysis provides the supporting information for a proposed rule that will amend the Nuclear Regulatory Commission's requirements for environmental review of applications for renewal of nuclear power plant operating licenses. After considering various options, the staff identified and analyzed two major alternatives. Alternative A is to not amend the regulations and to perform environmental reviews under the existing regulations. Alternative B is to assess, on a generic basis, the environmental impacts of renewing the operating license of individual nuclear power plants, and define the issues that will need to be further analyzed on a case-by-case basis. The findings of this assessment are to be codified in 10 CFR 51. The staff has selected Alternative B as the preferred alternative.

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ACKNOWLEDGEMENTS

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1.0 DISCUSSION OF THE ISSUE

NRC proposes to issue amendments to its regulations in 10 CFR Part 51 to codify the results of a generic environmental evaluation of the impacts associated with the license renewal of individual nuclear power plants. The results of this evaluation are contained in the draft Generic Environmental Impact Statement (GEIS) (NUREG-1437). Experience has shown that for certain environmental and safety issues, rulemaking can yield a number of societal benefits of direct or indirect importance, such as:

(1) Enhanced stability and predictability of the licensing process by providing regulatory criteria and requirements in discrete generic areas on matters that are significant in the review and approval of license applications.

(2) Enhanced public understanding and confidence in the integrity of the licensing process by bringing out for public participation important generic issues that are of concern to the agency and to the public.

(3) Enhanced administrative efficiency in licensing by removing, in whole or in part, generic issues from staff review and adjudicatory resolution in individual licensing proceedings and/or by establishing the importance (or lack of importance) of various safety and environmental issues to the decision process.

(4) An overall savings in the utilization of resources in the licensing process by the utility industry, those of the public whose interests may be affected by rulemaking, the NRC, and other Federal agencies, State and local government.

Operating licenses for the earliest commercial nuclear plants will begin to expire in the year 2000. The utility industry, DOE and the NRC have begun laying the groundwork for license renewal that will permit the continued safe and reliable operation of many licensed nuclear power plants well beyond their original 40-year license terms. Many electrical utilities have expressed interest in renewal of their currently held operating licenses for an additional period of time.

The NRC understands that the first two applications for license renewal will be submitted in 1991-1992. Based on discussions with licensees and industry representatives, NRC anticipates that a significant percentage of existing plants will submit applications for renewal of their operating license 10 to 20 years prior to their expiration. The NRC has issued a proposed rule, 10 CFR 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants" (55 Fed. Reg. 29083, July 17, 1990), that would establish the requirements that an applicant for renewal of a nuclear power plant operating license must meet, the information that must be submitted to the NRC for review so that the agency can determine whether these requirements have in fact been met, and the application procedures.

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In addition to the procedural and technical rulemaking under 10 CFR Part 54 the NRC is pursuing a separate rulemaking on 10 CFR Part 51 to generically address potential environmental impacts from renewal of the operating license of individual nuclear power plants. This rulemaking defines potential environmental impacts that need to be addressed in submittals to the NRC for review as a part of the application for license renewal of individual nuclear power plants

The NRC has concluded that there has been sufficient experience with power plant operation, maintenance, refurbishment and associated environmental impacts to predict the types and magnitude of environmental effects that may arise from renewal of operating licenses and the resulting extended plant operation.

As a part of the rulemaking, a GEIS has been prepared to assess which environmental impacts may occur, under what circumstances and their possible level of significance (Ref. 1). Results thus far indicate the feasibility of categorizing environmental impacts as follows

Category 1. A generic conclusion on the impact can be reached for all affected plants

Category 2. A generic conclusion on the impact can be reached for plants that fall within defined bounds.

Category 3. The environmental impact must be evaluated in each individual license renewal application. A generic conclusion on the impact was not reached for any affected plants.

In addition, the results of the study and changes to Part 51 provides the bases for a license renewal supplement to Regulatory Guide 4.2 "Preparation of Environmental Reports for Nuclear Power Stations"

The NRC has sought the views of the public, industry, and other Federal agencies in preparation for this rulemaking. An advance notice of proposed rulemaking (ANPR) entitled, "License Renewal for Nuclear Power Plants. Scope of Environmental Effects," (55 Fed. Reg. 29964, July 23, 1990) was issued. The advance notice outlined the proposed scope of environmental impacts to be addressed, and also identified alternatives for codification in Part 51. Comments were requested and the following questions were asked:

1. Is a generic environmental impact statement, or an environmental assessment, required by NEPA to support this proposed rulemaking, or can the rulemaking be supported by a technical study?
2. What alternative forms of codifying the findings of the generic environmental impact statement should be considered?
3. What activities associated with license renewal will lead to environmental impacts? By what mechanism will they lead to impacts?

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4. What topical areas should be covered in the generic environmental impact statement? Should the proposed outline be supplemented or restructured?
5. For each topical area what are the specific environmental issues that should be addressed?
6. For each topical area and each specific issue what information and data are required to perform generic analyses? Where do the information and data exist?
7. For each topical area and each specific issue what criteria should be used to judge the significance of the environmental impact?
8. For each topical area and each specific issue what is the potential for successful generic analysis?
9. What length of extended operating time can reasonably be addressed in the proposed rulemaking? To what extent is it possible to reach generic conclusion about the environmental impacts which would be applicable to plants having renewed operating licenses expiring in the year 2030, or 2040, 2050?

In summary, 29 comments were received, 19 supported the rulemaking, 7 supported it with qualifications, and 3 opposed it. An industry group with support from 16 utilities recommended using a generic environmental survey as a preferred technical method. All of the comments and recommendations have been considered by the NRC in the development of the proposed amendments to Part 51, the GEIS, the supporting guidance of Reg. Guide 4.2, and an Environmental Standard Review Plan (ESRP), NUREG-1429.

2.0 OBJECTIVES OF THE PROPOSED RULEMAKING

The proposed changes to 10 CFR Part 51 will enable the NRC to achieve the following objectives.

- To simplify the preparation of the environmental report by defining the potential generic and specific environmental impacts that must be addressed.
- To improve the efficiency in the NRC's review by removing such generic potential environmental impacts that pose no significant impact to the environment from staff review and adjudicatory resolution in individual license renewa proceedings
- To permit the use of an environmental assessment (EA) and a finding of no significant impact (FONSI). This rulemaking would reduce resource requirements when the information presented in an applicant's environmental report demonstrates that there are no significant environmental impacts associated with the limited set of issues that are assessed

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- To identify generic environmental impacts for public participation to achieve understanding and resolution, so that hearings for individual plant EISs will be more efficient.

If most of these objectives are realized, there should be an overall savings in the utilization of resources by the public, the utility industry, the NRC and other Federal agencies, and state and local governments.

3.0 ALTERNATIVES

In considering alternatives to the proposed rulemaking for Part 51, the NRC staff has taken into consideration its past experience with environmental impact statements (EISs), environmental assessments (EAs), generic environmental impact statements (GEISs), generic environmental surveys (GESs), and a detailed review of the public comments on proposed Part 51. A wide spectrum of possible options were considered. For example:

1. No rulemaking
2. Use of a GEIS as basis for proposed amendments to Part 51
3. Use of a GES as basis for amending Part 51
4. A categorical exclusion for license renewal
5. Establish an S-3 type table/chart (§51.50) for license renewal
6. Possible combinations of the above.

On review of these possible options, it was concluded that although the use of the GES (option 3) might eliminate certain publication, review and NEPA scoping requirements, these marginal advantages were not considered sufficient to outweigh the perceived disadvantage of whether such a non-NEPA document would be able to sustain legal challenges. In the case of option 4, it was not deemed possible to make the necessary finding that each unit that may apply for license renewal would not have some significant effect on the environment. Option 5 was proven to be impractical since all future environmental impacts of license renewal at individual unit sites were not amenable to generic assessment now. With the determination to remove options 3, 4, and 5 from consideration, option 6 was no longer deemed reasonable because the remaining options (1 and 2) are viewed to be mutually exclusive. Accordingly, the remaining options were judged to provide two reasonable alternatives that could be used to adequately characterize the costs and benefits of the proposed action to amend Part 51.

Alternative A - No Rulemaking. This alternative is a continuation of the current 10 CFR 51 regulations that require license renewal applicants to submit to the NRC a comprehensive update

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to their Environmental Report (ER). The whole range of environmental issues related to operation of each unit and any incremental changes related to extended operation under the terms of license renewal would be addressed. The NRC staff would have to review this supplement to the ER and prepare a draft EIS that addressed all environmental impacts associated with the extended operation of the unit under the terms of a renewed license. This would be done in accordance with §51.70 and 51.71. Requests for comments on the draft EIS in accordance with §51.73 and 51.74 would be required. This would be followed by the issuance of a final EIS and an opportunity for hearing would also occur for each individual unit's license renewal EIS.

Alternative B - Undertake Rulemaking to 10 CFR Part 51 to Generically Address Environmental Impacts Potentially Resulting From Nuclear Power Plant License Renewal This alternative limits the environmental impact issues that must be addressed on a plant-specific basis. Environmental impact issues that can be addressed in a generic sense, and for which findings of acceptability for all affected plants could be made, would not have to be analyzed on a plant-specific basis. Rather, these environmental issues and findings associated with license renewal would be treated generically, and this generic treatment would form the basis for a rule change to 10 CFR 51 to limit the scope of issues that would need to be considered in individual applications for license renewal. Alternative B would require the review and comment periods for the GEIS as required for the draft EIS under Alternative A. However, on conclusion of this process, no further litigation would be necessary or permitted on the findings of the GEIS in individual unit environmental reviews. Category 1 issues would not be addressed. Licensees would, however, address all Category 2 and Category 3 issues.

The GEIS is projected to limit environmental review activity at the time of individual plant license renewal. Alternative B reduces the effort needed by licensees to prepare their license renewal environmental report (ER) update. It also reduces the effort needed by the NRC to review the updated ER and to prepare either a draft EA or an EIS for only a limited number of issues. If the staff determines publication of a plant-specific draft EIS is necessary, it would follow the same procedures as in Alternative A including an opportunity for hearing, but would consider a narrower set of issues. The major difference associated with this determination is that the EA would not require both a draft and final version or consideration of public comments in between. The EA could result in a finding of no significant impact (FONSI) or a determination that an EIS is required. In the event of a FONSI, the cost-benefit balancing conclusion reached in the GEIS and codified in Part 51 would not be reassessed. The cost of an EA and FONSI will be less than that of an EIS. However, the following cost estimates are for a full EIS (Alternative A) and a limited EIS (Alternative B), thus resulting in conservatively low estimates of the savings of implementing Alternative B.

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4.0 COSTS

This section discusses the cost impacts of the two alternatives identified in Section 3. The two alternatives delineated above will impact costs to both industry and the NRC associated with license renewal environmental evaluations. Other than cost implications, there are no consequences associated with this proposed rulemaking action. The environmental documents which must be generated, whether based on the no-action alternative or the approach taking advantage of generic findings, must provide equivalent protection to the environment. Any actions taken as a result of these assessments, therefore, are assumed to be the same for either approach. That is, the plant configuration and operation into the license renewal period, and the resulting impacts to the environment, would be the same under either alternative. Any changes in plant structures, systems, and components, or in operating parameters would be primarily driven by the review process required by 10 CFR Part 54. There would be no difference in environmental risk for any plant between the two alternatives, and there would be no difference in radiological exposure associated with either routine operation or accidents. Therefore, only cost consequences are applicable, and only these are considered in this analysis.

The following discussions develop the costs for each approach, and estimate the incremental impacts (savings) associated with the adoption of Alternative B.

4.1. COST BASIS

The cost evaluations for the Part 51 regulatory analysis assume that the effort required to prepare a comprehensive license renewal update to a plant's ER would be roughly comparable to, or at least not greater than, the effort required for the update provided at the Operating License (OL) stage of a plant's licensing process. NUREG-0499, "Preliminary Statement on General Policy for Rulemaking to Improve Nuclear Power Plant Licensing," (Ref. 2) estimates that such efforts at the OL stage were as follows

Licensee Efforts for OL Stage ER	5000 to 15000 person-hours
NRC Review and EIS Efforts	2000 to 4000 person-hours.

The NRC efforts cited were those associated with the review of the applicant's ER update, and the preparation of the Environmental Impact Statement for the plant. They include efforts of both NRC contractors and NRC staff. Both the industry and NRC effort estimates include allowance for hearings.

The efforts required to perform the equivalent activities for license renewal purposes are estimated to be at about the midpoint of the range cited above for the ER and EIS generated at the

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OL stage of the original plant licensing. This estimate is thought to be somewhat conservative since plants seeking license renewal will have actual environmental impact data to draw upon from the initial construction and operation experience. Also, ongoing licensee and government agency assessments of nuclear plant environmental impacts could possibly reduce the effort needed to produce both an ER update for license renewal and the related NRC review efforts. However, the benefit of such information is difficult to quantify *a priori*, and such information may not be available for all plants. The efforts associated with the generation of a license renewal ER update, its review by the NRC, and the generation of the updated EIS for that plant are estimated to be as follows:

Licensee License Renewal ER Update	10000 person-hours
NRC Review and EIS Efforts	3000 person-hours

These estimates are thought to be reasonably representative of what might occur. There will undoubtedly be considerable variation in the effort required from one plant to the next. The sensitivity of the cost impacts to possible variations in the plant-specific efforts required are addressed in Section 4.5.

The costs associated with generating and reviewing license renewal ERs are based on the following labor rates. They are taken from NRC's generic cost estimating guidelines (Ref. 3), and the base rates are suitably escalated to reflect 1991 dollars.

Licensee labor rate (1991$, fully burdened)	$49.30/person-hour
NRC labor rate (1991$)	$47.90/person-hour

The industry rate represents fully-burdened cost. The rate shown assumes that a combination of utility staff and contractors or consultants prepare the ER.

The NRC hourly rate shown above reflects incremental costs associated with rulemaking actions. As such, it assumes that certain of NRC's overhead costs are fixed, and would not change because of the proposed rulemaking. In actuality license renewal is likely to require the hiring of additional NRC staff, and to some extent NRC overhead costs could increase. For the purposes of this analysis, these overhead costs are not included. The effect of this approach is to understate the cost savings associated with the proposed alternative.

The draft GEIS encompasses 118 commercial nuclear power generating units in the United States. This excludes Grand Gulf Nuclear Station Unit 2, Perry Nuclear Plant Unit 2, and Washington Nuclear Project Units 1 and 3, whose construction has been indefinitely suspended, are excluded. The 118 units are owned by 52 electric utilities and are located at 74 plant sites. This same reactor population, minus Rancho Seco and Shoreham units (whose operation in the future is

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very unlikely), were considered as potential applicants for license renewal. Since multiple unit/plant sites will have to apply separately for each unit, 116 units/plants were assumed to represent the potential number of applications for license renewal that should be considered for the calculation of industry-wide costs.

4.2 ALTERNATIVE A COST IMPACTS

Alternative A, as noted above, is the "no rulemaking" option. Existing regulations regarding environmental assessments must be followed. These current regulations require that a comprehensive ER update and supplemental EIS be produced for each plant proposed for license renewal. All environmental issues would have to be addressed.

Table 1 summarizes the cost impacts to both the nuclear industry and to the NRC. The consequences considering the reactor population as a whole depend on the number of plants for which license renewal is sought. In Table 1 the costs are given as a fraction of the current plant population applying for license renewal. The table also shows costs as a function of discount rate. Rates of 0%, 5%, and 10% are used to cover the practical range of possibilities for the foreseeable future. For each combination of reactor population fraction applying for license renewal and discount rate, separate values are presented for industry costs, NRC cost, and total costs (combined industry and NRC). Table 1 displays implementation costs only. Considerations of development cost impacts are addressed in Section 4.5.

The costs displayed in Table 1 are based on the assumption that applications for license renewal will typically be submitted twelve years prior to the expiration of the original 40-year license. This assumption is consistent with the time profile used in NUREG-1362 (draft), "Regulatory Analysis for Proposed Rule on Nuclear Power Plant License Renewal," (Ref. 4). The exceptions to this assumption apply to the License Renewal Lead Plants, Yankee Rowe, a pressurized water reactor (PWR), and Monticello, a boiling water reactor (BWR). The current licenses for these two plants expire in the years 2000 and 2011, respectively. The cost analysis performed here assumed that the Yankee submittal for license renewal would be made in 1991, and that for Monticello would be in 1992. The assumption was also made that both Yankee and Monticello would be among the plants applying for license renewal, regardless of the fraction of the plant population to actually do so.

The use of discount rates other than 0% requires a time profile of license renewal applications. While it is not known what the actual time profile of applications will be, the profile used is shown in Figure 1. The plot shows the number of license renewal applications submitted per year assuming that each submittal is made 12 years before the 40-year license expiration date. For the cases where less than 100% of the plants seek license renewal, the further assumption was made that the number of applications submitted in any given year would be

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proportionately reduced compared to the number shown in Figure 1. Since the Yankee and Monticello applications are assumed for all scenarios, and since these applications occur in the near future, the costs displayed in Table 1 are not quite proportional to the percentage of plants applying for license renewal. Changes in the time profile of applications will result in different present values of cost but does not significantly affect the relative cost of Alternative A compared to Alternative B.

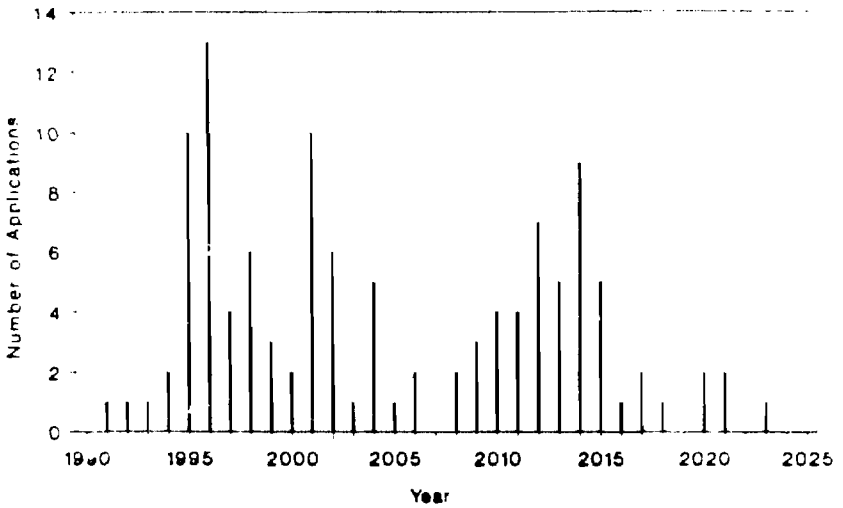

Figure 1. Number of License Renewal Applications per Year

Table 1
Implementation Costs for Alternative A
(Cost in 10^6 1991 $)

Percent of Reactor Population Applying for License Renewal		Discount Rates 0%	5%	10%
Industry Costs				
	25%	15.0	8.6	5.8
	50%	29.1	16.3	10.6
	100%	57.2	31.6	20.2
NRC Costs				
	25%	4.4	2.5	1.7
	50%	8.5	4.7	3.1
	100%	16.7	9.2	5.9
Total Costs				
	25%	19.4	11.1	7.5
	50%	37.6	21.0	13.7
	100%	73.9	40.8	26.1

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4.2.1 INDUSTRY COSTS

The licensee's effort needed to prepare a comprehensive, updated ER on any individual plant for which an application for license renewal is submitted is estimated to be 10,000 person-hours. At $49.30/person-hour, this results in an estimated cost of about $493,000 per plant in 1991 dollars.

Table 1 indicates that industry costs associated with the preparation of ERs under Alternative A could be as high as $57 million. This assumes that all 116 plants in the current population (does not include Rancho Seco and Shoreham) apply for license renewal. Projected costs decrease rapidly with increasing discount rates. This occurs because the license renewal applications, and their associated environmental assessments, are spread out over a considerable period of time.

4.2.2 NRC COSTS

As noted in Section 4.1, NRC's efforts associated with the review of license renewal ERs and the generation of plant EISs is estimated to be about 3000 person-hours per plant under Alternative A. This equates to NRC labor costs of about $144,000 per plant.

Table 1 presents estimates of NRC costs when considering the overall reactor population that may apply for license renewal. The NRC costs associated with Alternative A implementation are estimated to be as much as $17 million or as little as $2 million, depending on the number of relicensing applications received and processed and on the discount rate assumed.

4.2.3 TOTAL ALTERNATIVE A IMPLEMENTATION COSTS

The totals shown in Table 1 indicate that the combined cost to both industry and the NRC are estimated to be in the range of about $7 million to $74 million. The values displayed for the 5% discount rate are judged to be most realistic, and for this scenario the costs range from about $11 million to $41 million.

4.3 ALTERNATIVE B COST IMPACTS

The draft GEIS groups all of the various potential environmental impacts into one-hundred four (104) issues. It classifies each such issue according to the three categories noted in Section 1.0. Of the one-hundred four environmental impact issue groupings evaluated in the draft GEIS, many are of potential consequence only for certain types of plants. The maximum number of issue groupings that would have to be addressed for any individual plant is ninety-seven (97). Key parameters that establish the number of issue groupings pertinent to a given nuclear plant include, among others, the type of cooling system and the ultimate heat sink. The draft GEIS identified twenty-four (24) license renewal environmental impact issues that fell into Categories 2 and 3. These are

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the issue groupings that could potentially be addressed by all plants for which license renewal applications are made, or by all such plants whose impacts might fall outside of the bounds evaluated in the GEIS. On the other hand, more than eighty (80) issues are addressed on a generic basis (Category 1), and need not be addressed in individual license renewal applications. The computation of Alternative B costs, therefore, involved evaluating the number of non-generic issues associated with the different types of nuclear plants.

A review of the Category 2 and 3 areas indicates that several apply only to certain types of plants. For example, in aquatic ecology three Category 2 issues apply only to plants with once-through heat dissipation systems and another three apply only to plants with cooling pond heat dissipation systems. This analysis is based on the simplifying assumption that each applicant applying for license renewal will expend effort on twenty-two issues on a plant-specific basis.

Given the number of issues to be addressed on a plant-specific basis, cost consequences associated with Alternative B can be assessed for individual plants and for the industry as a whole. This requires that assumptions be made as to the cost of addressing each plant-specific issue. For the current assessment, cost per area was established simply by dividing the total effort needed to perform a comprehensive assessment by the maximum number of issues addressed in such an effort. In reality, of course, each environmental issue will require an evaluation which involves either more or less than the average effort. The effort required will depend on the complexity of the issue, and for a particular issue will likely vary from one plant to the next. While issue-specific complexity could have been assessed, and labor efforts adjusted accordingly, this approach would introduce additional uncertainties into the evaluation and was not used in this analysis.

The NRC's costs associated with the review of the licensee's ER submittal, and the preparation of the corresponding EIS or EA, were estimated in a manner analogous to the development of licensee costs. NRC's labor effort per issue was established based on the estimated effort needed to conduct a comprehensive review of a full scale ER, as discussed in Section 4.1.

Table 2 summarizes the estimated cost impacts to both industry and the NRC associated with the implementation of Alternative B. As with Table 1 for Alternative A, costs are shown for three discount rates and for three different fractions of the light water reactor power plant population seeking license renewal. Total implementation costs are also displayed.

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Table 2
Implementation Costs for Alternative B
(Cost in 10^6 1991 $)

Percent of Reactor Population Applying for License Renewal		Discount Rates 0%	5%	10%
Industry Costs				
	25%	4.8	3.0	2.3
	50%	8.6	5.1	3.6
	100%	16.3	9.3	6.2
NRC Costs				
	25%	1.4	0.9	0.7
	50%	2.5	1.5	1.0
	100%	4.7	2.7	1.8
Total Costs				
	25%	6.2	3.9	3.0
	50%	11.1	6.6	4.6
	100%	21.0	12.0	8.0

4.3.1 INDUSTRY COSTS

As noted in Section 4.1, the licensee's effort needed to prepare a comprehensive, updated ER on any plant for which an application for license renewal is submitted is estimated to be 10,000 person-hours. Based on a maximum of ninety-seven (97) issues to be addressed in a comprehensive effort, this yields an average of slightly more than 103 person-hours per issue. This per-issue effort, coupled with the estimate that each plant will have to address twenty-two plant specific issue areas, yields estimates of industry costs. For the industry as a whole, assuming 116 plants apply for license renewal, and for the "average" plant effort associated with Alternative B, the results are as follows:

Total Industry Cost (undiscounted 1991$)	$16 million
Average Plant Cost (undiscounted 1991$)	$134,000.

The average plant costs given here do not factor in the costs incurred by the lead plants.

The industry costs noted above assume that the two lead plants, Yankee and Monticello, will not benefit from the proposed Part 51 rulemaking, and that both plants will have to prepare comprehensive ERs. The costs for their efforts are assumed to be $493,000 per plant, and these costs are reflected in the $16 million quoted for the total industry cost. Also, this industry total cost assumes that all 116 plants in the reactor population apply for license renewal. The costs are undiscounted, i.e., they do not reflect the time spread over which these expenditures are likely to occur.

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The Alternative B consequences to industry as a whole depend on the number of facilities for which license renewal is sought. The values presented in Table 2 indicate that costs to industry under Alternative B are estimated to range from as little as $2.3 million to more than $16 million, depending on the scenario considered.

The costs displayed in Table 2 are based on the same set of assumptions used to define Alternative A consequences. They assume that, except for the Yankee and Monticello plants, license renewal applications will typically be submitted twelve years prior to the expiration of the original 40-year license. The time profile of number of applications per year shown in Figure 1 was used to develop Table 2.

4.3.2 NRC COSTS

Section 4.1 noted that the NRC's effort to review a comprehensive license renewal ER, and prepare the attendant EIS, is estimated to require on the order of 3000 person-hours. Based on a total of ninety-seven issues that would be addressed in a comprehensive effort as discussed previously in Section 4.3, this gives an average effort of slightly more than 30 person-hours per issue areas. NRC's potential overall expenditures for industry-wide relicensing ER reviews are estimated below. Per plant average expenditures are also noted.

Total Potential NRC Cost (undiscounted 1991$)	$4.7 million
NRC Average Per-Plant Cost (undiscounted 1991$)	$39,000

Table 2 gives NRC costs associated with the adoption of Alternative B. Costs are displayed based on the percentage of the reactor plant population seeking license renewal and on alternative discount rates.

4.3.3 TOTAL ALTERNATIVE B IMPLEMENTATION COSTS

The totals shown in Table 2 indicate that the Alternative B combined implementation cost to both industry and the NRC are estimated to be in the range of about $3 million to $21 million. The lower figure corresponds to a small fraction of the reactor population pursuing license renewal together with a high (10%) discount rate. The high figure corresponds to all plants seeking license renewal and 0% discount rate. The values displayed for the 5% discount rate are judged to be most realistic, and for this scenario the costs range from about $4 million to $12 million.

4.4 INCREMENTAL IMPACTS ASSOCIATED WITH THE ADOPTION OF ALTERNATIVE B

Nuclear plant license renewal, if it is pursued, will require that applicants perform an assessment of potential environmental impacts associated with extended plant life. This requirement can be met with either Alternative A, the no-rulemaking alternative, or Alternative B

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which reduces the number of environmental issues that must be addressed on a plant-specific basis. The proposed changes to 10 CFR Part 51, and as represented by Alternative B, can significantly reduce the burden on both industry and the NRC regarding the preparation and review of environmental report updates associated with license renewal and the preparation of the EIS/EA. The draft GEIS indicates that, of the total issues that must be addressed, the majority can be addressed on a generic basis. The proposed changes to 10 CFR Part 51 would limit those license renewal environmental issues which need to be considered on a plant-specific basis and, therefore, would result in significant cost savings to both industry and the NRC. Table 3 summarizes these estimated cost savings. Overall industry savings are estimated to range from about $41 million for a high percentage of the plant population seeking license renewal and a low discount rate to about $3 million if few plants apply and a high discount rate prevails. Savings to the NRC due to the adoption of Alternative B range from about $12 million to about $1 million over the range of conditions noted. The combined savings to both industry and the NRC range from about $53 million to $4 million.

Table 3

Incremental Impacts Associated With the Adoption of Alternative B (Cost in 10^6 1991 $)

Percent of Reactor Population Applying for License Renewal		Discount Rates 0%	5%	10%
Industry Costs				
	25%	(-)10.2	(-)5.6	(-)3.5
	50%	(-)20.5	(-)11.2	(-)7.0
	100%	(-)40.9	(-)22.3	(-)14.1
NRC Costs				
	25%	(-)3.0	(-)1.6	(-)1.0
	50%	(-)5.9	(-)3.3	(-)2.1
	100%	(-)11.9	(-)6.5	(-)4.1
Total Costs				
	25%	(-)13.2	(-)7.2	(-)4.5
	50%	(-)26.4	(-)14.5	(-)9.1
	100%	(-)52.9	(-)28.8	(-)18.2

(-)Denotes cost savings

4.5 SENSITIVITY STUDIES

This section discusses the effects of two different elements that can be considered in defining costs of the two alternatives. The first considers the effects of NRC's regulation development costs

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The second considers the effects of the base level of effort required to prepare and review the necessary environmental impacts documentation.

4.5.1 REGULATORY DEVELOPMENT COSTS

The NRC has expended considerable resources in the development of the proposed changes to 10 CFR Part 51. These resources include the efforts needed to develop the proposed changes, prepare the draft GEIS, and perform related actions. The proposed rule will also require the development of a Regulatory Guide for the preparation of updated license renewal environmental reports. Similarly, an Environmental Standard Review Plan must be developed to assist the NRC in its review of the ERs submitted with license renewal applications.

NRC development efforts are also associated with Alternative A, which is the continuation of current requirements. In the absence of the proposed changes to 10 CFR Part 51, an updated license renewal environmental report Regulatory Guide is still needed, as is an updated Environmental Standard Review Plan for the review of these environmental documents submitted by applicants.

Estimates of NRC's regulatory development efforts and costs associated with both Alternative A and the proposed Alternative B are as follows:

	Alternative A	Alternative B
NRC Professional Staff Effort	14 staff months	88 staff months
Staff Cost, 1991$	$116,000	$730,000
Contractor Assistance, 1991$	$1,150,000	$3,800,000
Totals, 1991$	$1,270,000	$4,530,000

The major distinction between the developmental costs of Alternatives A and B, aside from their absolute size, is that A's costs are yet to be incurred whereas B's, for the most part, are already sunk. Because Alternative A's developmental costs are still outstanding they are an appropriate consideration in this regulatory analysis. Only if A is selected will developmental costs on the order of $1 million be expended. Thus, the incremental cost to proceed with A is $1 million. Alternatively, if B were chosen, the incremental impact would be considerably smaller because most of its developmental expenditures are sunk costs and as such are no longer relevant. That is, the sunk costs exist independent of our ultimate decision and, therefore, they are not incremental impacts that can be attributed to Alternative B. That portion of B's developmental costs that are still outstanding are relevant but are projected to be smaller than A's developmental costs. However, for conservatism, the staff assumes they are equivalent and thus the cost implications of NRC developmental costs are assumed to be neutral in this regulatory analysis. In

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order to see if these sunk costs would have any effect on the bottom line conclusions, a sensitivity study was performed that includes the sunk costs

Table 4 shows the impact on costs when the expenditures for NRC's regulation development are included in the assessment. The values shown are based on a 5% discount rate. Separate sets of figures are shown for Alternative A, Alternative B, and the differences between Alternative B and Alternative A. The higher development costs of Alternative B are more than offset by the savings possible by implementing the proposed changes to 10 CFR Part 51. With the 5% discount rate, the savings range from about $4 million to about $26 million, depending on the number of plants seeking license renewal. At lower discount rates the savings increase for Alternative B relative to Alternative A. Even under the conditions of a small fraction (25%) of the reactor population applying for license renewal and a higher discount rate (~10%) Alternative B remains less costly than Alternative A, including consideration given to the greater regulation development costs of Alternative B.

Table 4
Overall Costs Associated With License Renewal
Environmental Impact Evaluations and Reviews
(10^6 1991 $)
5% Discount Rate

		Incremental Costs	
Percent of Reactor Population Applying for License Renewal	Alternative A	Alternative B	Alt. B Relative to Alt. A
Industry Costs			
25	8.6	3.0	(-)5.6
50	16.3	5.1	(-)11.2
100	31.6	9.3	(-)22.3
NRC Costs			
25	2.5	0.9	(-)1.6
50	4.7	1.5	(-)3.3
100	9.2	2.7	(-)6.5
NRC Development Costs	1.3	4.5	3.2
Total Costs			
25	12.4	8.4	(-)4.0
50	22.3	11.1	(-)11.2
100	42.1	16.5	(-)25.6

(-) Denotes cost savings

4.5.2 SENSITIVITY TO ENVIRONMENTAL REPORT AND EIS/EA PREPARATION EFFORTS

Section 4.1 noted that there is uncertainty in the level of effort required for licensees to prepare an ER supplement to accompany their license renewal submittals. Similarly, the level of

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effort to be expended by the NRC in the review of these submittals and the attendant preparation of the EIS for each plant is also somewhat uncertain. The reference level of effort assumed for the licensee to prepare an ER for Alternative A was 10,000 person-hours, and the corresponding NRC review and EIS/EA preparation effort was 3,000 person-hours. By taking full advantage of existing ERs and the environmental impact data collected over the years of plant operation, it is possible that licensee efforts could be considerably less than the base effort assumed. Similarly, larger efforts are also possible. For applications for which a FONSI is supportable, it is likely that a lower level of effort may be necessary of applicants as well as the NRC.

The sensitivity of the cost results to the level of effort required to prepare and review the necessary environmental impact documents was explored. Table 5 shows the results of this sensitivity study. The savings attributable to the adoption of Alternative B relative to Alternative A are shown for the reference case, and for cases based on one-half and 1.5 times the reference level of effort. The cost savings vary directly with the base level of effort required except for the consideration of regulation development costs. The development costs are assumed to remain fixed, regardless of the base ER/EIS/EA preparation efforts assumed. As indicated in Table 5, the cost savings possible by adopting Alternative B decrease if the labor effort is lower than that assumed for the reference case, and they increase if a higher labor effort is assumed.

4.6 IMPACTS ON OTHER REQUIREMENTS

The proposed 10 CFR Part 51 will have no impact on other NRC programs. There will be a positive benefit in the implementation of 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," but no other interactions. Since this rulemaking applies specifically to NRC licensees, no impact on other government agencies or state programs is foreseen.

4.7 CONSTRAINTS

Since the lead time for applications for license renewal can be up to 20 years, there will be no constraint to implementation arising from scheduling. The time allowed for public participation through the ANPR and the publication of a proposed rule for comment should assure that no policy, institutional or legal considerations that arise will be resolved before issuance of the final rule change. Enforceability of the amended 10 CFR Part 51 will be no different than enforcement of the regulations of the existing 10 CFR 51. Since publication of the final rule, no enforcement problems have been experienced. It should be noted, however, that this rulemaking schedule may

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Table 5
Sensitivity of Cost Savings to ER and EIS/EA Preparation Efforts
(10^6 1991 $)
5% Discount Rate

Percent of Reactor Population Applying for License Renewal	Incremental Costs of Alternative B Relative to Alternative A: 0.5 x Base Case	Base Case	1.5 x Base Case
Industry Costs			
25	(-)2.8	(-)5.6	(-)8.4
50	(-)5.6	(-)11.2	(-)16.8
100	(-)11.2	(-)122.3	(-)33.5
NRC Costs			
25	(-)0.8	(-)1.6	(-)2.4
50	(-)1.7	(-)3.3	(-)5.0
100	(-)3.2	(-)6.5	(-)9.8
NRC Development Costs	3.2	3.2	3.2
Total Costs			
25	(-)0.4	(-)4.0	(-)7.6
50	(-)4.1	(-)11.2	(-)18.6
100	(-)11.2	(-)25.6	(-)40.1

(-) Denotes cost savings

not significantly benefit the two lead plants (Yankee Rowe and Monticello) who will submit applications in 1991 and 1992. The extent of any benefits cannot be quantified for these lead plants, even though the information developed thus far will be used to support the staff's environmental findings for each plant.

5.0 DECISION RATIONALE

Adoption of the proposed rule would minimize the costs associated with evaluating the environmental impacts caused by extending the operational licenses of commercial nuclear power reactors. There are no other impacts associated with the adoption of the proposed rule.

The adoption of the proposed rule is estimated to result in substantial cost savings to both the nuclear industry and to the NRC. Savings are anticipated because the rule change would reduce the license renewal environmental impact issues that need to be addressed on a plant-specific basis. The proposed change to 10 CFR Part 51 would reduce or eliminate duplication of effort among license renewal applicants in addressing those environmental issues for which a generic conclusion can be reached on the acceptability of the impacts for all affected plants. Overall industry savings are estimated to range from a high of about $41 million to about $3 million, depending on the

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percentage of the plant population seeking license renewal and the discount rates applicable. Cost savings to individual applicants for license renewal are estimated to be about $360,000. Total NRC savings due to the adoption of Alternative B range from about $1 million to about $12 million over the range of conditions noted.

Considering the costs to both industry and the NRC, the total cost savings with Alternative B range from $5 million to $53 million. With the use of the 5% discount rate, judged to be the most realistic scenario, the savings range from $7 million to $29 million.

Based on the findings of this analysis, the staff has selected Alternative B as the preferred approach.

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REFERENCES

1 NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants," U.S. NRC, August 1990.

2. NUREG-0499, "Preliminary Statement on General Policy for Rulemaking to Improve Nuclear Power Plant Licensing," December, 1978.

3. NUREG/CR-4627, Rev. 1, "Generic cost Estimates: Abstracts From Generic Studies for Use in Preparing Regulatory Impact Analyses," U.S. NRC, December 1988.

4 NUREG-1362 (draft for comment), "Regulatory Analysis for Proposed Rule on Nuclear Power Plant License Renewal," July, 1990.

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