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**U. S. REGULATORY REQUIREMENTS FOR NUCLEAR PLANT LICENSE RENEWAL:
THE B & W OWNERS GROUP LICENSE RENEWAL PROGRAM**

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ABSTRACT

This paper discusses the current U.S. Regulatory Requirements for License Renewal and describes the Babcock & Wilcox Owners Group (B&WOG) Generic License Renewal Program (GLRP). The B&W owners, recognizing the need to obtain the maximum life for their nuclear generating units, embarked on a program to renew the licenses of the seven reactors in accordance with the requirements of the Atomic Energy Act of 1954 and further defined by Title 10 of the Code of Federal Regulation Part 54 (10 CFR 54). These reactors, owned by five separate utilities, are Pressurized Water Reactors (PWR) ranging in net rated capacity from approximately 800 to 900 MW. The plants, predominately constructed in the 70's, have USNRC Operating Licenses that expire between 2013 to 2017.

I. THE HISTORY OF LICENSE RENEWAL

The history of U. S. License Renewal is a long one. It began with the Atomic Energy Act (AEA) of 1954 which established the licensing process and the capability for those licenses to be renewed. In December of 1990, 10 CFR 54 "Requirements for Renewal of Nuclear Plant Operating Licenses" was issued. The AEA appears to have arbitrarily specified a 40 calendar year operating lifetime for nuclear facilities. There is some speculation about why 40 years was chosen to be the maximum licensed lifetime of a plant.

Regardless of its origination, the 40 year life of a nuclear unit has been woven into the very fiber of design and licensing theory. Early designs were bounded by this duration, cost estimates are generally gauged by it, and regulations were set to cover it. There was little consideration of the license renewal option until the late 1970's when the utilities began to recognize the finite lifetime of their nuclear facility's operating license and the implication that replacement capacity would have to be constructed to replace the existing nuclear capacity. This

was a new and perplexing consideration as it became clear that their nuclear units faced an administrative constraint on their operating lifetimes, particularly when they had been operating fossil units well beyond 40 years.

Early studies, spawned by these concerns, drew preliminary conclusions that license renewal could be a cost effective alternative for future generating capacity. Most of these efforts were tabled in light of the Three Mile Island accident. But by 1985, evaluation activities began again.

The Electric Power Research Institute (EPRI) sponsored Pilot Studies to evaluate the feasibility of life extension and license renewal. These studies involved two operating nuclear facilities, a Boiling Water Reactor (BWR) and a Pressurized Water Reactor (PWR). The plants, Northern States Power's Monticello (BWR) facility and Virginia Power's Surry (PWR) units successfully demonstrated both technical and economic feasibility.

Given the positive results of the early Pilot Studies, EPRI in coordination with the Department of Energy (DOE) began

the Lead Plant Program. This program again sponsored two plants, Monticello continuing as the BWR and Yankee Atomic's Rowe unit as the PWR. The intent of this program was to actually test the license renewal process and achieve a 'renewed' operating license.

In addition, Industry Reports (IRs) were sponsored by the Nuclear Utility Management and Resources Council (NUMARC), EPRI, and DOE to evaluate certain plant systems, structures, and components (SSCs) for age related degradation. The industry felt that many SSCs and degradation mechanisms could be evaluated and resolved on a generic, industry wide basis. These IRs were to be prepared and submitted to the U. S. Regulatory Commission (USNRC) for review and approval by Safety Evaluation Report (SER) issuance.

All of these programs have evolved into programs much different than those first proposed. Yankee Rowe ceased operation prior to the expiration of the initial operating license and is preparing for decommissioning. Monticello, as of December 1, 1992, has indefinitely postponed submittal of their license renewal application (LRA). The Industry Reports have been prepared, submitted, and preliminarily reviewed by the USNRC. SER preparation and issue is now in question due to USNRC resource limitations and questions regarding the adequacy of the technical evaluations.

The status of the lead plants is of particular concern since the outcomes for both plants were primarily influenced by the rising cost of nuclear generation. Although both plants had specific issues that affected these costs, the scenarios are not altogether different than those faced by an operating nuclear plant. Operation and maintenance (O&M) costs are rising at an alarming rate for many plants and alternate power supplies appear to be abundant and inexpensive. The current competitive situation is likely to result in continued plant closings like San Onofre I and Trojan until the industry is able to control rising O&M costs while ensuring an acceptable level of safety. Although not feasible for all facilities, license renewal can provide that competitive advantage.

Significant regulatory action has also been completed in the license renewal arena. "Requirements for Renewal of Operating Licenses for Nuclear Power Plants", 10CFR54, defines the regulatory requirements for license renewal. The draft Regulatory Guide (DG-1009) and Standard Review Plan (NUREG 1299) offer additional guidance and interpretation of 10CFR54. The regulatory documents provide a framework for an applicant to identify systems, structures and components (SSCs) important to license renewal,

evaluate age related degradation, and finally manage that degradation as specified by 10CFR54. The thrust of these evaluations is to reasonably ensure the functional capability of important SSCs. The detail required to satisfy the regulations can basically be proven only by exercising the license renewal process with actual technical submittals. Uncertainty about detail implementation has created significant industry concern about the viability and cost of license renewal.

The multitude of regulatory documents certainly provide guidance, but until they are fully demonstrated and interpreted, a great deal of uncertainty exists in the license renewal process. To help reduce the uncertainty, 10CFR54 is being revised to make clearer the need to reasonably ensure the SSC function as defined in the licensing basis of the plant. The revision is to further limit evaluations of SSCs when programs exist that ensure the function. The B&WOG approach capitalizes on this philosophy by relying heavily on existing performance test and condition monitoring to ensure the functionality of plant SSC.

II. THE CURRENT ENVIRONMENT

A. Industry

The nuclear industry appears to be hesitant to begin formal license renewal programs in the current environment. The uncertainty surrounding the license renewal process and the associated costs seem to cause utilities to postpone the pursuit of a renewed license despite the ever approaching expirations of their current license.

There is also concern of drawing unnecessary attention to currently operating plants because of the very public license renewal process. The risk of intervention in the license renewal process is high and the cost associated with it is uncertain but potentially significant. In the case of Monticello, the public and regulatory processes have closed the cost/benefit analysis to an unacceptable margin.

The message from the industry remains clear. If it is not cost effective to continue to safely operate a nuclear facility for any period of time, within or beyond its original license, a utility will discontinue operations. A renewed license will allow capital costs, often incurred late in plant life, to be spread over a longer period. These additional years of amortization can make a huge economic difference to an operating nuclear unit.

Recently several programs have been announced which will help establish a cost effective license renewal process.

Baltimore Gas and Electric (BG&E) has been pursuing a Life Cycle Management approach to plant evaluation for several years. The Westinghouse Owners Group (WOG) have recently announced a coordinated license renewal program and the GE and CE owners are considering similar programs as of the writing of this paper.

At this time, the B&W Owners Group (B&WOG) and the Westinghouse Owners Groups have the most complete and aggressive program. The B&WOG and WOG work is anticipated to form the basis for other Owners Group or individual utility work since most if not all technical reports will be publically available and non-proprietary. The technical reports could be used directly by other owners, if applicable, or with a small incremental analysis which to compare, contrast, or take exception to the B&WOG findings.

B. Regulatory

The regulator has a responsibility to provide minimum requirements for the safe operation of the nation's nuclear facilities despite the cost. Although aware of the significant affect regulation has on cost, the USNRC's first responsibility is safety.

The review leading to issuance of a new or renewed license seems to have provided the regulator with the opportunity to review each and every aspect of a plant's design, operation and maintenance. On the other hand, if a plant has demonstrated reasonable operations under its current licensing basis, then the question should become one of merely identifying the additional degradation expected during extended operation.

The staff, in trying to answer industry a Commission level questions regarding industry concern over the license renewal process, established a Senior Management Review to assess the license renewal rule. The USNRC staff recognized the need to coordinate and credit maintenance rule activities (10 CFR50.65 'Requirements for monitoring the effectiveness of maintenance at nuclear power plants') and focus on degradation unique to the period of continued operation. The maintenance rule is a new regulation that provides a regulatory framework for existing plant maintenance and test activities. This rule requires continued attention to the adequacy of plant actions that manage aging by setting system type performance goals. When these goals are not met, special attention is required by establishing goals for a particular component, or other action to improve the performance of the system.

The current USNRC staff position is similar to the industry position allowing liberal credit for compliance with the maintenance rule and puts additional emphasis on functional performance of SSCs resulting in a far more cost effective process with no impact on safety.

III. THE GENERIC LICENSE RENEWAL CONCEPT

A. Program Principles and Objectives

The B&W Owners Group (B&WOG) Generic License Renewal program (GLRP) has been carefully designed to address the issues and concerns in the license renewal arena. All five utilities with operating B&W units (Duke Power, Entergy Operations, Florida Power, GPU Nuclear, and Centerior Energy) participate in the program. The goal of the program is to establish a cost effective license renewal process which serves the member utilities. This process must be acceptable to the USNRC and, therefore, can become a model for the industry at large.

The GLRP process illustrated in Table 1 is a technically sound, cost effective process to identify and manage potentially significant age degradation. Final judgement on the process relates to 10CFR54 is currently being evaluated in light of the impending changes to the rule .

As shown in the flowchart (Table 1), the program pools resources from the five member utilities to develop screening methodologies, address technical issues surrounding age related degradation, and ensure effective programs are in place to manage the age related degradation. The technical work required for license renewal is anticipated to be substantially complete for all B&WOG plants. Closure on the issues, both process and technical, is anticipated through submittal of technical reports and issuance of Safety Evaluation Reports (SERs) by the USNRC. The technical reports will be submitted as they are prepared beginning in with screening methodologies submitted in 1993 until program completion in early 1997. This will facilitate regular re-evaluation of the cost/benefit analysis to ensure progress is commensurate with investment and that extended operation remains a viable alternative.

The GLRP will demonstrate the entire license renewal process by submittal of a license renewal application for at least one plant of the group. This plant will be used as a consistent example for the technical submittals, but since the GLRP technical submittals are intended to envelope all the B&WOG units, the actual plant name will not be revealed. This attribute is unique to the B&WOG program. At this

time, no other owners group or individual utility has committed to filing an actual application.

This 'generic' approach is anticipated to relieve the immediate burden of plant specific issues while allowing resolution of a significant number of technical issue. Current estimates suggest that 80% to 90% of the systems, structures, and components which are important to license renewal can be treated within the scope of the GLRP. Individual plant characteristics will be evaluated by each utility and submitted for regulatory review at the time of the plant specific license renewal application.

B. Program Deliverables

As mentioned above, technical reports covering the majority of issues for all the units will be periodically submitted to the USNRC for review and issuance of SERs. These reports are anticipated to be in three types; generic methodologies, enveloping technical reports, and plant specific submittals.

Generic methodologies will include reports which describe and define the processes used to screen and further evaluate systems, structures, and components. Program planning and management information will also be submitted, but formal review and SERs will not be requested.

Technical reports will be submitted to identify effects of age related degradation and evaluate programs which are effective at managing this aging. These reports will envelope all of the participating plants unless there is some particular design element which is substantially different for an individual unit. For those specific structures or components, plant specific reports will be filed at the time of the individual license renewal application.

The GLRP will include plant specific reports also. These individual reports will be submitted for at least one unit of the group illustrating issues such as system, structure and component screening results. The final license renewal application and FSAR supplement for the lead B&WOG unit will also be plant specific but considered to be within the scope of the generic program.

C. Program Estimate

The program estimate was prepared by review of existing programs, such as the lead plant programs, and preliminary work completed by B&WOG member utilities. The schedule for 1993 was detailed by task, then each task was evaluated by the project team for not only time but resource

commitment.

Changes in the regulatory requirements have significantly reduced the cost of this program. The original rule required collection of plant specific environmental data for important SSCs which was labor and schedule intensive. The original estimate of \$45M included the evaluation of the same scope of equipment however, the evaluation focuses on the reasonable assurance of function as opposed to detailed scientific evaluation of degradation mechanisms.

The current estimate of about \$10M in contractor funding and about \$7M in utility funds includes generation of methodologies, procedures, and project management tools. It also includes evaluation of systems, structures and components that are generic to the B&WOG plants. That generic population is estimated to be approximately 80% to 90% of the plant SSCs which are important to license renewal. The estimate does not include plant specific technical evaluations such as plant environmental evaluations but does include the resources required for utility review of the program deliverables.

The program estimate and schedule will be reviewed and updated at least annually to reflect program progress and work remaining.

IV. RISKS AND BENEFITS OF LICENSE RENEWAL

A. Competitive Advantage

A nuclear unit with a good safety and operating record and contained costs can remain a viable generation alternative for any utility. The problem is how to contain the costs within the arbitrary 40 year life established by the existing license. Absent a well defined license renewal process, or better still a renewed license, decisions must be made based on the remaining plant life or the current OL expiration.

For many utilities, the rising cost of operation and maintenance, as well as anticipated capital expenditures, may make the nuclear option less cost effective than other generation sources. When incremental capital costs can be spread over an additional 20 years, the picture becomes different and more cost effective.

The B&WOG members expect that the benefits of extended operation substantially outweigh the cost of pursuing the license renewal program as described above. Without a renewed license, the nuclear option is foreclosed as a viable generation alternative at expiration of the current license. In fact, there will continue to be questions as to

whether some nuclear units can cost effectively operate to their current license expiration date. Establishing an efficient and predictable license renewal process has the potential to significantly improve the economic viability of operating a nuclear unit.

B. Validates Current Maintenance Activities

A deterministic evaluation of aging and identification of current programs which address them has the potential to reduce component maintenance and surveillance requirements. An objective of the GLRP is to evaluate the current programs and ensure that those programs are not excessive. Existing programs which effectively manage aging and/or ensure function include ASME Section XI (i.e., ISI and IST), preventive maintenance, periodic maintenance, and operator rounds. The ultimate goal is to attempt to not only contain, but reduce current operating expenses while maintaining an acceptable level of safety.

The discipline imposed by the deterministic license renewal Individual Plant Assessment (IPA) process facilitates aging evaluation and provides a forum to review these determinations with the regulator. By evaluating structure and component functions and degradation effects, existing program effectiveness should be relatively straightforward. If existing programs are in place within the current licensing basis to manage plausible degradation mechanisms, then the degradation is not unique to the license renewal term and need not be addressed further. Unnecessary requirements can then be eliminated. Additional aging management practices can be implemented and their effectiveness demonstrated through detailed evaluation and practical experience, but only where necessary to do so.

V. CONCLUSIONS

Uncertainty in the license renewal process can only be reduced by a demonstration. The B&WOG has committed to pursuing license renewal and submitting at least one license renewal application by December 1997. The condition for this commitment is that reasonable USNRC interpretations be provided in process through the formal approval of technical reports. This formal approval will allow on-going evaluation of the cost effectiveness of the license renewal option. The evaluations will satisfy the technical requirements for the B&WOG owners and can pave the way for the industry as a whole.

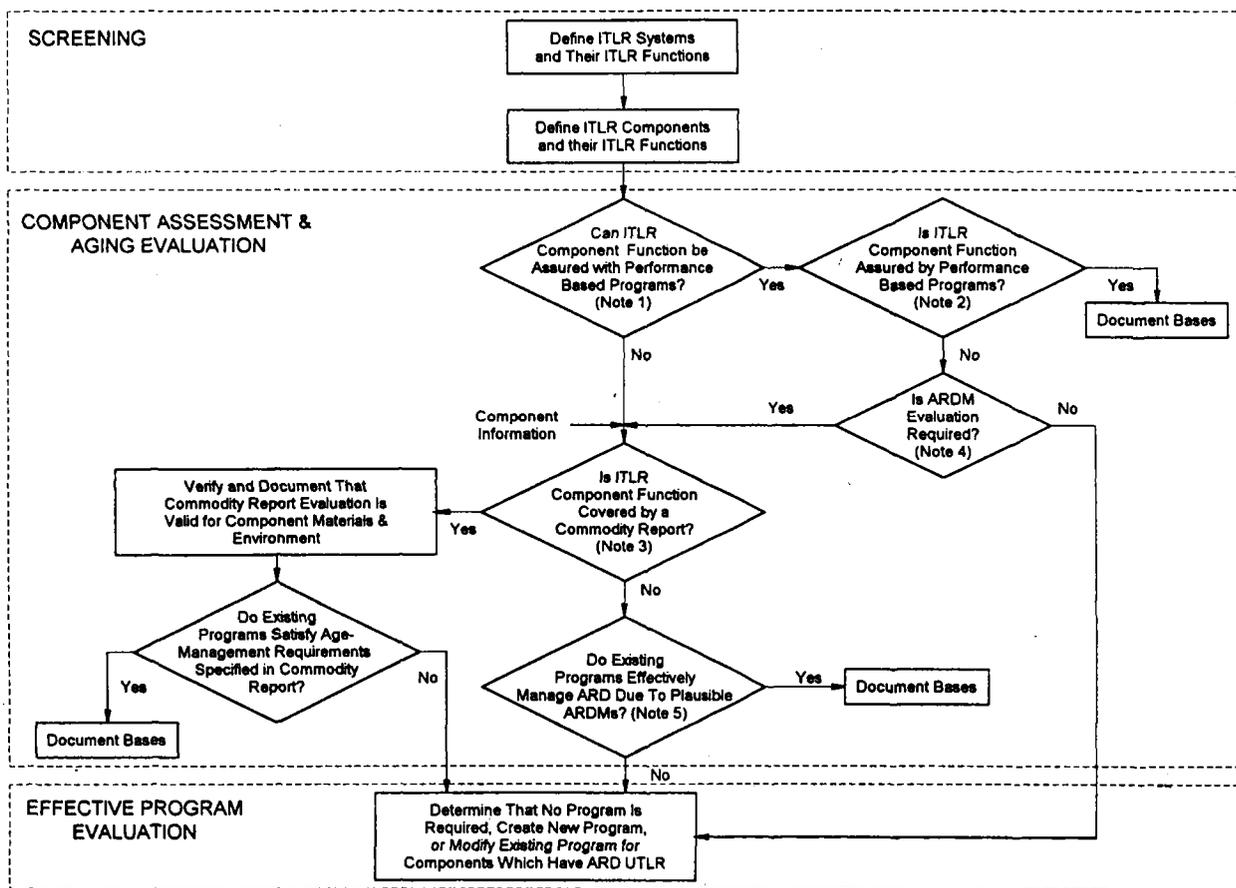
The industry and the USNRC must continue to solve policy issues such as the continuity of the current licensing basis, the implications of the 'new' license and the depth of

the evaluation required to demonstrate that aging is managed. Reasonable solutions to these policy issues will be critical in keeping the license renewal option cost effective. As history has demonstrated, without that positive economic analysis, nuclear plant operations will not be viable. License renewal can help strengthen cost effective plant operation and maintain the nuclear option into the 21st century and a generic owners group program .

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B&WOG GLRP IPA PROCESS



7-E-6

Table 1

Session 8
Two-Phase Flow Modeling and Applications-I