Office of Nuclear Reactor Regulation

Self Assessment of License Renewal Application Improved Safety Review Process

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Table of Contents

Executive Summary

In December 2004, P.T. Kuo, Program Director for the License Renewal and Environmental Impacts Program (RLEP) established a Task Team to assess the U.S. Nuclear Regulatory Commission's (NRC), Office of Nuclear Reactor Regulation (NRR) implementation of the license renewal application (LRA) improved safety review process used at the three pilot plants: Farley Nuclear Plant, Units 1 and 2; Arkansas Nuclear One - Unit 2; and D.C. Cook, Units 1 and 2. The improved process integrates the aging management program (AMP) and aging management review (AMR) line item reviews performed by the technical staff and the newly established Division of Regulatory Improvement Programs (DRIP), License Renewal and Environmental Impacts Program, Section B (RLEP-B), project teams.

The Task Team (the team) consisted of representatives from DRIP, Division of Engineering (DE), Division of Systems, Safety and Analysis (DSSA), Division of Inspection Program Management (DIPM), and Region II. The charter of the six-member task team was to assess the level of success of the LRA improved process (the audit/technical review process) and provide recommendations on actions that would result in additional efficiencies when implementing the LRA improved process. The team's activities included review of representative program procedures and documents, interviews of NRC management and staff, and a member of the Advisory Committee on Reactor Safeguards (ACRS) and its consultant for license renewal.

The team concluded that the improved process is a success because it: (1) provides for the verification of an applicant's "consistent with the Generic Aging Lessons Learned (GALL) Report" claim in their respective LRAs; (2) effectively manages the increase in the number of LRA reviews while allowing DE resources to be better focused on more safety significant operating reactor issues (i.e., Davis-Besse Lessons-Learned, materials degradation); (3) allows NRC staff and applicants to better focus their resources on those requests for additional information (RAIs) and their associated responses that are needed to support the staff's evaluation.

The team believes that the combination of the improved process and updates to the GALL Report and "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," NUREG-1800 (SRP-LR) should further enhance the effectiveness and efficiency of the overall LRA review process.

The team believes that additional improvements are achievable and has provided recommendations to the following key areas:

(1) Communications
(2) Guidance Documents
(3) Staff Documents
(4) Project Team Composition
(5) Schedule and Resources
(6) Training
(7) Other Areas

Acronyms

ACRS	Advisory Committee on Reactor Safeguards
AERM	Aging effect requiring management
AMP	Aging management programs
AMR	Aging management reviews
CLB	Current licensing basis
DE	Division of Engineering
DIPM	Division of Inspection Program Management
DSSA	Division of Systems, Safety and Analysis
DRIP	Division of Regulatory Improvement Programs
EEIB	Electrical and Instrumentation & Controls Branch
FTE	Full-time equivalent
GALL	Generic Aging Lessons Learned Report
IQI	Integrated quality initiative
ISG	Interim staff guidance
LRA	License renewal application
NEI	Nuclear Energy Institute
NUREG	Nuclear regulatory guide
NRC	Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation (NRC)
OGC	Office of the General Counsel
PM	Project Manager
RAI	Request for additional information
RLEP	License Renewal and Environmental Impacts Program
SC	Structures and components
SER	Safety evaluation report
SRP-LR	Standard review plan - license renewal
SSC	Systems, structures, and components
TLAA	Time limited aging analyses
UFSAR	Updated final safety analysis report
WPC	Work Planning Center

1. Introduction

The primary objective of the Task Team (the team) charter was to evaluate the effectiveness of the changes made to the improved process used to perform the aging management program (AMP) and aging management review (AMR) line item reviews of license renewal applications (LRAs). This new process integrates AMP and AMR reviews performed by the technical staff and the newly established License Renewal and Environmental Impacts Program, Section B (RLEP-B), project teams. Although this integration is limited primarily to Division of Engineering (DE) technical staff and RLEP-B staff, there are potential impacts on other internal organizations and the team felt it appropriate to solicit feedback from these other organizations as well. Therefore, the team was divided into two groups.

The first group consisted of the team members from the Division of Systems, Safety and Analysis (DSSA), Division of Inspection Program Management (DIPM), and Region II. This group was responsible for collecting input from their respective divisions or the regions and providing feedback on the impact of the new process or the overall LRA review process.

The second group consisted of team members from DE and RLEP. This group observed numerous internal and external license renewal meetings, conducted 35 interviews from a diverse list of individuals, including NRR management and staff personnel, knowledgeable of the license renewal process, as well as a member of the Office of General Counsel (OGC) staff and the Advisory Committee on Reactor Safeguards (ACRS) and its consultant for license renewal. In addition, the group assessed the adequacy of guidance documents and evaluated resource expenditures in support of the new process.

Collectively, the team received over 200 comments that provided valuable insights from various internal stakeholders. Individuals provided candid and insightful feedback about the new process and the license renewal application review process in general. This input was evaluated by the team and grouped into key areas where improvement is recommended. The goal was to identify improvements in guidance and the process that would benefit future applicants and the staff rather than focus on improvements already identified and implemented. This paper forwards the evaluation and recommendations of the team's efforts.

2. Background

10 CFR 54.4 contains the requirements for systems, structures, and components (SSCs) that are included within the scope of the license renewal applications. The SSCs are those that are: (1) safety-related; or (2) nonsafety-related but whose failure could affect safety-related functions; and (3) relied on to demonstrate compliance with the NRC's regulations for fire protection, environmental qualification, pressurized thermal shock, anticipated transients without scram, and station blackout. An applicant for a renewed license must review all SSCs within the scope of license renewal to identify those structures and components (SCs) subject to an AMR. SCs subject to an AMR are those that perform an intended function without moving parts or without a change in configuration or properties (passive), and that are not subject to replacement based on qualified life or specified time period (long-lived). Pursuant to 10 CFR 54.21(a)(3), an applicant for a renewed license must demonstrate that the effects of aging will be managed in such a way that the intended function or functions of those SCs will be maintained, consistent with the current licensing basis (CLB), for the period of extended operation.

In July 2001, the NRC staff issued NUREG-1801, "Generic Aging Lessons Learned (GALL) Report." The GALL Report is the technical basis document that summarizes staff-approved AMPs for the aging management of a large number of SCs that are subject to an AMR. It also summarizes the aging management evaluations, programs, and activities acceptable to the NRC staff for managing aging of most of the SCs used in commercial nuclear power plants, and serves as a reference for both the applicant and staff reviewers to quickly identify those AMPs and activities that the staff has determined will provide adequate aging management during the extended period of operation. The GALL Report is treated in the same manner as an approved topical report that is generically applicable. An applicant may reference the GALL Report in its LRA to demonstrate that its programs correspond to those that the staff reviewed and approved in the GALL Report.

After issuance of the GALL Report in 2001, NRC and industry collaborated on a "demonstration project" to discuss how LRAs could reference the GALL Report to gain efficiency. As decided in the demonstration project, if an applicant determined that AMPs or AMR line items were consistent with the GALL Report, they would state this in the LRA and maintain the detailed program descriptions and supporting documentation on-site. For AMPs based on the GALL Report, the LRA referred to the GALL Report for the first nine AMP elements (Ref. Section 3.1, Table 1) and included a discussion of operating experience to support the tenth element. The LRA also discussed any exceptions to the GALL Report recommendations and enhancements to current plant practices. For AMR line items based on the GALL Report, the LRA listed the AMPs used to manage the aging effects and, if applicable, discussed how the applicant addressed the further evaluation recommended in the GALL Report. The technical staff would review the LRA applicants "consistent with the GALL Report" claims, but because the applicants were not required to provide the information justifying the consistency with GALL Report, the technical staff in headquarters could not verify the claims. The Office of the General Counsel (OGC) was concerned with the staff's reliance on an applicant's "consistent with the GALL Report" claim as the sole basis for acceptance without some method of verification. As a result, an on-site audit was adopted in order to verify the LRA statements with respect to consistency with the GALL Report.

In August 2003, the RLEP staff began the development of a new process, called the improved process, to improve the review of LRAs in order to make the license renewal program more effective and efficient. The improved process incorporates the use of on-site audits to maximize the efficiencies inherent in using the GALL Report. The project team is responsible for: verifying compliance with 10 CFR 54.21(a)(3) for the GALL Report items (AMPs and AMR line items); the review of exceptions or enhancements to the GALL Report; and those AMPs and AMR line items that were previously approved by the staff (past precedence). The technical staff is responsible for verifying compliance with 10 CFR 54.21(a)(3)for emerging (e.g. hot topics) and new technical issues (e.g. no past precedence). The improved process enables the staff to review more LRAs simultaneously, while continuing to meet the 22 month review schedule (with no hearing).

The improved process was piloted on Farley, Units 1 and 2, Arkansas Nuclear One - Unit 2, and D.C. Cook, Units 1 and 2. This process continues to be used today.

3. Improved Safety Review Process

The LRA review process is managed by staff in the Division of Regulatory Improvement Programs (DRIP). The improved process integrates AMP and AMR reviews performed by the technical staff and RLEP-B staff. This improved process only changes the review responsibilities and processes for Chapter 3, Appendix A and Appendix B of the LRA. These LRA sections cover AMRs, the Updated final safety analysis report (UFSAR) update, and AMPs, respectively. The improved process for these LRA sections is discussed below.

Under the improved process, the applicant identifies those AMPs and AMR line items that are consistent with the GALL Report or are based on past precedence that has been accepted by NRC staff. The RLEP-A Project Manager (PM) then performs a review of the AMPs and AMR line items and, based on the applicants classifications, develops a work split for DE technical reviewers and the RLEP-B project team. The RLEP-B project team's scope of review consists of all AMPs and AMR line items that are consistent with the GALL Report or are based on NRC accepted past precedence, except for those items identified as unresolved or emergent issues, which go to DE and DSSA for review. DE and DSSA's scope of review also includes the remaining plant specific AMPs and AMR line items.

The project teams and technical staff review their assigned AMPs and AMRs against the requirements of Title 10 of the *Code of Federal Regulations*, Part 54 (10 CFR Part 54), "Requirements for Renewal of Operating Licenses for Nuclear Power Plants;" the guidance provided in "Standard Review Plan for Review of License Renewal Application for Nuclear Power Plants," NUREG-1800 (SRP-LR), dated July 2001; the guidance provided "Generic Aging Lessons Learned (GALL) Report," NUREG-1801, dated July 2001; and the audit plan. For the defined scope of work, the project team and technical staff verify that the applicant's aging management activities and programs will adequately manage the effects of aging on structures and components, so that their intended functions will be maintained consistent with the plant's CLB for the period of extended operation.

3.1 RLEP-B Project Teams

In support of the staff's safety review of the LRA for a plant, RLEP-B leads a project team that audits and reviews assigned AMRs and associated AMPs credited by the applicant in its LRA. The project team includes both NRC RLEP-B staff and engineers provided by RLEP-B's technical assistance contractor and conducts its audit and review in accordance with its audit plan. The audit plan describes the RLEP-B audit process, which includes preparation of the audit report and safety evaluation report (SER) input, and identifies the scope of work assigned to RLEP-B.

The project team performs its work at NRC Headquarters, Rockville, Maryland; at the contractor's office; and at the applicant's offices. The project team conducts a public exit meeting near the plant site after it completes its on-site work. DE's review is conducted in the NRC Headquarters office. Questions and clarifications requiring a written response from the applicant are documented, tracked and dispositioned using requests for additional information (RAIs) which are prepared by NRC staff and responded to on the docket by the applicant.

The overall objective of the audit and review is to verify compliance with 10 CFR 54.21(a)(3). Therefore, the audit and review process helps ensure that for each structure and component within the scope of the project team's review, the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

The audit and review procedure is intended to accomplish the following objectives:

- For plant AMPs that the applicant claims are consistent with the GALL AMPs, verify that:
  - plant AMPs contain the program elements of the referenced GALL AMP (for the seven program elements that are within the scope of review of the project team)
  - conditions at the plant are bounded by the conditions for which the GALL AMPs were evaluated.

- For plant AMPs that the applicant claims are consistent with the GALL AMPs with exceptions, verify that:
  - plant AMPs contain the program elements of the referenced GALL AMPs
  - conditions at the plant are bounded by the conditions for which the GALL AMPs were evaluated
  - the applicant has documented an acceptable technical basis for each exception.

- For plant AMPs that the applicant claims will be consistent with the GALL AMPs after specified enhancements are implemented, verify that:
  - plant AMPs, with the enhancements, will be consistent with the referenced GALL AMPs, or are acceptable on the basis of a technical review
  - the applicant identified the enhancements as commitments in the UFSAR or other docketed correspondence.

- For plant-specific AMPs, verify the AMPs are acceptable on the basis of a technical review of the seven program elements that are within the scope of the review of the project team. Where past precedence is cited by the applicant, verify that the applicant's claims are consistent and technically justifiable with AMPs that the staff has previously approved for another plant.

- For AMRs that the applicant claims are consistent with the GALL Report, verify that the plant AMRs are consistent with the criteria of the GALL Report or can be accepted on the basis of an NRC-approved precedent or otherwise technically justifiable.

- For AMR line items for which the GALL Report recommends further evaluation, verify that the applicant has addressed the further evaluation, and evaluated the AMRs in accordance with the SRP-LR.

Aging Management Programs

Table 1, below, summarizes the program elements that comprise an AMP. Of these 10 elements, elements 1 through 6, and element 10 are within the project team's scope of review. (DIPM reviews program elements 7, 8, and 9.) The result of DIPM and DRIP's review is documented in Section 3 of the staff's SER.

For the AMPs for which the applicant claimed consistency with the AMPs included in the GALL Report, the project team reviews the plant's AMP descriptions and compares program elements 1 through 6, and program element 10 for the plant's AMPs to the corresponding program elements for the GALL AMPs. The project team verifies that the plant's AMPs contain the program elements of the referenced GALL program and that the conditions at the plant are bounded by the conditions for which the GALL program was evaluated.

For each plant AMP that has an exception or an enhancement, the project team determines whether it is acceptable, and whether the AMP, as modified by the applicant, will adequately manage the aging effects for which it is credited. If the project team identifies a difference between a GALL AMP credited by the applicant and the plant AMP, which the applicant did not address in the LRA, the project team reviews the difference to determine whether the plant AMP, as modified by the difference, will adequately manage the aging effects for which it is credited.

For those plant AMPs that are based on past precedence, the project team reviews the AMP against the seven program elements that are within its scope of review. On the basis of its technical reviews, the project team determines whether these AMPs will manage the aging effects for which they are credited.

Table 1. Aging Management Program Element Descriptions

Element		Description
1	Scope of the program	The scope of the program should include the specific SCs subject to an AMR.
2	Preventive actions	Preventive actions should mitigate or prevent the applicable aging effects.
3	Parameters monitored or inspected	Parameters monitored or inspected should be linked to the effects of aging on the intended functions of the particular SC.
4	Detection of aging effects	Detection of aging effects should occur before there is loss of any structure and component intended function. This includes aspects such as method or technique (i.e., visual, volumetric, surface inspection), frequency, sample size, data collection and timing of new/one-time inspections to ensure timely detection of aging effects.
5	Monitoring and trending	Monitoring and trending should provide prediction of the extent of the effects of aging and timely corrective or mitigative actions.
6	Acceptance criteria	Acceptance criteria, against which the need for corrective action will be evaluated, should ensure that the particular SC intended functions are maintained under all CLB design conditions during the period of extended operation.
7	Corrective actions	Corrective actions, including root cause determination and prevention of recurrence, should be timely.

Element		Description
8	Confirmation process	The confirmation process should ensure that preventive actions are adequate and appropriate corrective actions have been completed and are effective.
9	Administrative controls	Administrative controls should provide a formal review and approval process.
10	Operating experience	Operating experience involving the AMP, including past corrective actions resulting in program enhancements or additional programs, should provide objective evidence to support a determination tht the effects of aging will be adequately managed so that the SC intended functions will be maintained during the period of extended operation.

Aging Management Reviews

The AMRs in the GALL Report fall into two broad categories: (1) those for which the GALL Report concludes that the GALL AMPs are adequate to manage aging of the components referenced in the GALL Report; and, (2) those for which the GALL Report concludes that aging management is adequate, but further evaluation is recommended for certain aspects of the aging management process. For its AMRs, the project team determines: (1) whether the AMRs reported by the applicant to be consistent with the GALL Report are indeed consistent with the GALL Report; and, (2) whether the plant-specific AMRs reported by the applicant to be based on a previously-approved precedent are technically acceptable and applicable. For component groups evaluated in the GALL Report for which the applicant claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the project team reviews the applicant's evaluation to determine if it adequately addressed the issues for which the GALL Report recommended further evaluation.

NRC-Approved Precedents

To help facilitate the staff review of LRAs, where applicable, applicants reference NRC-approved precedents to demonstrate that certain non-GALL AMPs correspond to programs that the staff had approved for other plants during its review of previous LRAs. Using the precedent information, the project team: (1) determines whether the information presented in the precedent is applicable to the applicant's facility; (2) determines whether the applicant's AMP is bounded by the conditions for which the precedent was evaluated and approved; and (3) verifies that the applicant's AMP contains the program elements of the referenced precedent. In general, if the project team determines that these conditions are satisfied, it will use the precedent to frame and focus its review of the applicant's AMP.

It is important to note that precedent information is not a part of the LRA; it is supplementary information voluntarily provided by the applicant as a reviewer's aid. The existence of a precedent, in and of itself, is not a sufficient basis to accept the applicant's AMP. Rather, the precedent facilitates the review of the substance of the matters described in the applicant's AMP. As such, in the project team's documentation of its reviews of AMPs that are based on precedents, the precedent information is typically implicit in the evaluation, rather than explicit. If the project team determines that a precedent identified by the applicant is not applicable to the particular plant AMP for which it is credited, then the project team reviews the AMP as a plant-specific AMP, without consideration of the precedent information.

UFSAR Supplement Review

Consistent with the SRP-LR, for the AMRs and associated AMPs that it will review, the project team reviews the UFSAR supplement that summarizes the applicant's programs and activities for managing the effects of aging for the extended period of operation. The project team also reviews any commitments associated with its programs and activities made by the applicant and verifies that they are acceptable for the stated purpose.

Documents Reviewed by the Project Team

In performing its work, the project team relies heavily on the LRA, the applicant's bases documentation for the LRA AMPs and AMRs provided by the applicant during the on-site audit and review, on-site discussions with the applicant's technical staff, the audit and review plan, the SRP-LR, and the GALL Report. The project team also examines the applicant's precedent review documents, its AMP and AMR basis documents (catalogs of the documentation used by the applicant to develop or justify its AMPs and AMRs), and other applicant documents, including selected implementing procedures. These documents are used to verify that the applicant's activities and programs will adequately manage the effects of aging on structures and components.

3.2 Technical Staff Review

The technical staff's review is conducted in the NRC Headquarters office with occasional support by contractors. The reviewers use the information in the LRA, any supporting documents provided by the applicant, the plant's UFSAR, and other publicly-available documents (such as other submittals, SERs, inservice inspection plans, inspection reports, etc.). Questions and clarifications requiring a written response from the applicant are documented, tracked and dispositioned using RAIs which are prepared by NRC staff and responded to on the docket by the applicant.

For AMRs, the technical staff verifies that all aging effects requiring management (AERMs) have been identified for the components, based on the component material, environment(s), and industry operating experience. Several applicants have used multiple AMR line items (in LRA Chapter 3) to fully explain their assessment of AERMs and characterize the similarities or differences from the GALL Report. In these cases, there is some overlap between the technical staff and project team reviews of a component's AMR. As part of the AMR review, the staff also verifies that the identified AMP is appropriate for the identified AERM; however, the detailed review of the AMP elements is left for the AMP reviewer.

For AMPs, the technical staff reviews program elements 1 through 6, and element 10, as described in Table 1 (DIPM reviews program elements 7, 8, and 9). The technical staff verifies that the actions described in the LRA description of the AMP will adequately manage the aging effects for which it is credited. In some cases, the AMP is used in conjunction with other actions/AMPs identified in the AMR, and the staff limits its review to the intent of the particular AMP. For example, AMPs designed to prevent aging effects are frequently used in conjunction with AMPs for inspecting and verifying that the aging effects are not occurring. The staff's review focuses on the AMPs ability to prevent or identify aging effects, as applicable.

Consistent with the SRP-LR, for the AMRs and AMPs in its review scope, the technical staff reviews the UFSAR supplement that summarizes the applicant's programs and activities for managing the effects of aging for the extended period of operation. The staff verifies that the supplement provides a sufficient description of the AMP activities and scope. The project team also reviews any commitments associated with the AMPs and verifies that they are acceptable for the stated purpose.

4. Observations/Recommendations

4.1 Communications

Implementation of the improved process presented an adaptive challenge to the NRR organization. Prior to implementing the improved process, the RLEP staff briefed the NRR Leadership and Executive Teams and obtained their agreement to proceed with the pilot effort. During the initial phase of the pilot plant reviews, communications amongst the various NRC internal stakeholders involved in the LRA review process were frequent and effective at the working level. However, communication at the Branch and Section level was not quite as frequent and sufficient buy-in was not fully obtained. Since the pilot plant reviews, the level of communications on the improved process and any modifications to it has been mixed. The general knowledge of the current audit process is not well understood by most organizations outside of RLEP. Thus, this has impacted the organizations acceptance of the improved process, most notably by the DE staff.

The staff held monthly conference calls with the Nuclear Energy Institute (NEI) to discuss the improved process, pilot plant lessons learned and expectations for applicant support. However, these meetings were discontinued because of a lack of identified issues. Since then communications is done on a more ad hoc basis at meetings scheduled for other license renewal topics or through the industry's own communications.

We believe a meeting should be held with external stakeholders to: provide feedback from the results of this self-assessment; discuss the staff's collective audit and review experiences and observations for applicant consideration; and solicit comments from NEI, other industry representatives and members of the public. A lessons-learned meeting was held early in the pilot process (December 2003) and we believe a similar meeting would be very beneficial to the staff and future applicants.

The team believes that improved communications amongst the various NRC groups involved in the LRA review process and industry representatives could be further enhanced.

Recommendations:

- RLEP should continue to seek opportunities (e.g., DE Division Meeting, Regional counterpart meetings) to brief internal stakeholders involved in the LRA review process on program improvement initiatives (i.e., audit process guidance and enhancements, SER shell development).

- RLEP should continue to conduct lessons-learned meetings on the improved process with external stakeholders.

- Communications between technical reviewers and project team members should be enhanced on: (1) emerging technical issues; and (2) significant project team or technical reviewer findings. The enhanced communications would encourage an exchange of insights from their respective reviews.

- RLEP should enhance communications with the Regional offices by: (1) offering regions an opportunity to observe Headquarters on-site audit activities (i.e., DIPM scoping and screening, RLEP-B AMP/AMR), if their inspection resources allow; (2) coordinating project team site visits, in order to minimize potential impacts on planned inspections (the schedule should capture DE, DSSA, DRIP, DIPM, and Region LRA activities with emphasis on on-site audits coordination and SER input); (3) discussing the issuance of near term products (i.e., draft SER, inspection reports) that may impact each others area of review; and (4) discussing draft SER open items that may be closed out under regional inspection activities.

- RLEP should conduct periodic, informal meetings with LRA review support organizations (i.e., OGC, DE, DSSA, etc...) to solicit feedback on the license renewal program.

- RLEP PMs should conduct internal kick-off meetings between the project team leader and assigned technical reviewers to discuss the LRA work assignments. This will ensure a common understanding of the work assignments and provide an opportunity to highlight any emerging issues and discuss relevant insights from previous review experience.

- RLEP should enhance the Public License Renewal web page to provide a broad overview of the safety review process, similar to what is discussed in the "Backgrounder on Reactor License Renewal."

4.2 Guidance Documents

The team assessed the adequacy of the documents that contain guidance for the LRA review process. Those assessed include:

(1) NRR Office Instruction RNWL-100, "License Renewal Application Review Process"
(2) Audit and Review Plan for Plant Aging Management Programs and Reviews"
(3) "Template for Audit and Review Report for Plant Aging Management Programs and Reviews"
(4) "Writing Guide and Template for Preparing License Renewal Application Audit and Review Report"
(5) Draft Safety Evaluation Report Template
(6) Project Team AMP Worksheets
(6) Draft Audit Report SER Input Template
(7) Draft NRR Safety Project Manager's Handbook for license renewal application reviews

In general the team found the guidance documents were adequate for consistency in NRC review of LRAs, but updates are warranted. Comments on some specific guidance documents follow.

During the three pilot plant reviews, RLEP-B recognized the need to standardize and simplify the preparation for and documentation of audit activities. As a result, they developed a draft "Audit and Review Plan for Plant Aging Management Programs and Reviews," a "Template for Audit and Review Reports for Plant Aging Management Programs and Reviews," a draft "Writing Guide and Template for Preparing License Renewal Application Audit and Review Report," and Project Team AMP Worksheets.

Using the "Template for Audit and Review Plan for Plant Aging Management Programs and Reviews" as a guide, the project team leader can more efficiently generate a plant-specific audit plan for use by the project team members. This guide was first used during the Arkansas Nuclear One - Unit 1 LRA review and continues to be used for subsequent LRA audit plan development.

The "Template for Audit and Review Reports for Plant Aging Management Programs and Reviews" and the "Writing Guide and Template for Preparing License Renewal Application Audit and Review Report" were developed to assist project team members with the preparation of the audit and review report. They contain various writing AMP/AMR templates with specific writing structures and recommended text. The report template was used during the Brunswick Steam Electric Plant LRA review to pre-write the audit report boiler plate prior to the project team going to the site. The writing guide was useful in ensuring consistency within the audit report. Additionally, using the report template to insert the 'boiler plate' portions of the audit report into the report prior to conducting the first audit, allowed the project team more time to incorporate audit and review results into the report after the audit. The template also highlighted areas where the project team needed to focus during the on-site audit thereby reducing the number of follow on questions and RAIs which improves audit efficiency.

The AMP and AMR worksheets were developed to provide a basic description of the AMP seven elements (see Table 1 in the section on Improved Safety Review Process above**)** and Final Safety Analysis Report description to support the project team's onsite evaluation. The worksheets are useful for documenting review results to support writing the audit report. However, enhancements are needed to capture experience gained from previous audits. This is especially important to new project team members who rely heavily on these worksheets to guide their project activities.

RLEP-B has also started to develop a "Project Report SER Input Template" to guide and assist the project team leader with the transfer of information from the project audit and review report to the draft SER. While we commend RLEP-B for this initiative, we believe they should discontinue this effort and instead focus on modifying the project report so that information is more easily transferred into the draft SER.

The team believes the project plan template, project report writing template, project report writing guide and template, and AMP worksheets provide an excellent road map for project team members to follow when preparing, conducting and documenting project activities. In addition, the guidance documents are a good source for training material for new project team members.

The team recognizes that efforts are underway to update most of these documents to reflect recent lessons learned during the LRA review process. We believe this is a worthwhile effort and

all guidance documents should be reviewed and updated, as necessary. Once complete, future changes should be limited in order to stabilize the LRA review process.

The team did not assess the draft versions of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power," April 2001, NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," July 2001, and Draft Regulatory Guide 1140, Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses which were issued in January 2005, for a 60-day public comment period. The staff is currently reviewing and incorporating public comments where appropriate with plans to issue the final versions in September 2005. The team believes the RLEP staff has done an exceptional job coordinating and communicating with internal and external stakeholders throughout this update process. It is anticipated that the revised documents will further enhance the effectiveness and efficiency of the LRA review process.

Recommendations:

- RLEP should continue to review and update guidance documents to reflect lessons learned during the pilot and subsequent LRA reviews to date. Future reviews should be limited in order stabilize the LRA review process.

- RLEP-B should continue to enhance the AMP and AMR worksheets by incorporating additional guidance based on lessons learned.

- RLEP-B should continue the expedited effort to update the GALL Report by September 2005.

- RLEP-B should discontinue the further development and refinement of the plant-specific SER input template and instead focus its efforts on modifying the audit report so that information is more easily transferred into the draft SER.

- RLEP should coordinate monthly meetings between the Interim Staff Guidance (ISG) coordinator, RLEP-B project team members and technical staff representatives to focus on the status of ISGs and emerging issues under review. Currently the status of ISGs are discussed during the weekly license renewal interface meeting for which the primary purpose is to discuss the status of the various LRA review schedules. ISGs are often glossed over and a discussion of emerging technical issues sometimes dominates the interaction to the detriment of the LRA schedule discussion.

4.3 Staff Documents

4.3.1 Audit Report

RLEP-B audit reports document the results of the project team's audit and review work in support of the staff's safety review. Peer reviews of the draft audit reports for the pilot plants were conducted by DE technical reviewers. These reviews resulted in a number of recommendations on improving the audit report. DE's comments were appropriately incorporated by RLEP-B before issuing the final audit reports and have also been addressed, as applicable, into

subsequent revisions to their guidance documents and audit reports. Since the pilots, RLEP-B has taken on responsibility of performing the peer reviews.

Feedback from ACRS members and PMs indicates that the audit reports are quality documents that are well written, organized and clearly articulate the team's basis for accepting an applicant's AMPs, AMRs, and supporting documentation.

The team believes that the combination of finalizing the guidance documents previously discussed and the peer review process are good initiatives that should contribute to the overall continued good quality of the audit reports.

Recommendations:

- RLEP-B project team members should continue to pre-write audit reports based on the LRA and the template before going to the site to conduct the first audit.

- RLEP-B should strive to develop the audit report input within one week of completing the site visit to maximize memory retention from audit activities and complete the first draft of the audit report before the scheduled public exit meeting.

- RLEP-B should continue to peer review draft audit reports.

- RLEP-B should modify the audit report format so that it better aligns with the format of the SER.

4.3.2 Safety Evaluation Report (SER)

The SER documents the technical review and safety evaluation of the applicant's LRA by the NRC staff. The team believes the overall quality of the draft SERs issued for review by the pilot plant applicants is good. However, the steps taken to achieve that overall good quality prior to issuance of a draft SER has required significant effort to meet the milestone schedule, most notably by the PM. The quality of SER input from the various organizations is mixed and while many examples of inadequate quality were identified during the PMs preparation or OGC's review of the draft SER, feedback to the originator or their supervisor is virtually nonexistent. The team believes that a contributing factor to quality issues is the lack of an SER template for draft SERs.

RLEP, Section A (RLEP-A) has recognized the need to improve the process for preparing the draft SER to improve its overall quality and ensure consistency of format and writing style. RLEP-A has hired a contractor to provide administrative assistance with the preparation of draft SERs. Use of a contractor should also help reduce some of the administrative burden on PMs and technical reviewers who routinely incorporate information from the applicant's LRA. Using the "Draft Safety Evaluation Report Template," a plant-specific LRA, and the most current draft SER issued as an example, the contractor prepares a draft SER shell. The shell will provide a complete draft SER with exception of the project team and technical staff evaluation input which are highlighted by insertion indicators. RLEP-A is using this process to prepare draft SERs for LRAs currently under review. Upon completion of the current LRA draft SERs, RLEP-A

envisions a future goal for providing the draft SER shell to LRA review staff two months from the LRA submittal date. The team believes this is a good initiative.

To further improve the quality of draft SERs and its associated input, the team believes that the RLEP-B "Template for Audit and Review Reports for Plant Aging Management Programs and Reviews" and the "Writing Guide and Template for Preparing License Renewal Application Project and Review Report" should be used as a model to update the SER style guide for use by both project team members and technical reviewers. In the past, a style guide was developed for each plant-specific LRA. The style guide provided guidance for preparation of the SER input and RAIs. The team believes that an updated style guide, with examples, when used in combination with the SER shell provided by RLEP-A, and improved communication amongst the review organizations, will greatly enhance and provide for a more consistent and higher quality draft SER.

Recommendations:

- RLEP-A should ensure that the SER template under development, appropriately reflects the current technical staff SER input templates.

- RLEP-A should update the SER style guide for use during LRA reviews.

- RLEP should provide training on the use of the SER shell to technical reviewers so they have a clear understanding of the expectations for its use.

- RLEP-A PMs should ensure that the SER shell for their respective LRA under review is developed and provided to the technical staff and project teams within two months of receipt of the LRA submittal.

- RLEP-A should make every attempt to provide a complete draft SER to OGC for their review and concurrence in order ensure continuity in the document. Providing a draft SER on a chapter-by-chapter basis should be the exception, not the norm.

- RLEP-A should develop an Integrated Quality Initiative (IQI) process form to provide feedback to the technical staff reviewers and project teams on the quality of their SER input which identifies strengths and areas for improvement. This process should be used to return unacceptable work for revision rather than RLEP-A correcting the work themselves. This type of feedback will improve efficiencies in the long run and not overburden the PM in the short-run. RLEP-A should consider OGC comments on the quality of draft SERs that they review in preparing this form.

4.3.3 Requests for Additional Information (RAIs)

The face-to-face interaction with the project team and LRA applicant during the pilot process has increased the effectiveness and efficiency of the RAI process by helping to clarify, justify and identify those RAIs and the associated RAI responses that are needed to support the staff's draft SER in a much more timely manner. The team believes that onsite audits and the increased use of "consistent with the GALL Report" AMPs by the applicants has reduced the average number of RAIs for the pilot plants reviews when compared to the previous four LRA reviews by 33%. A

continuation of this trend is highly dependent on the quality of each LRA and the applicants willingness to include information that is repeatedly asked for by the staff. However, the use of RAI numbers as a metric should not interfere with the staff's ability to ask questions and responsibility to make sound safety decisions.

In general, the quality of RAIs were good. However, some instances arose where RAIs did not directly relate to the current LRA under review (i.e., from a past review), information in the LRA already addressed the issue or were duplicates between the project team and DE technical reviewers. Some NRR section chiefs have an expectation that their staff develop SER input with corresponding place holders which they use to guide their RAIs. The team believes that this a good practice and should be consistently applied for all LRA reviews.

The quality of RAI responses was not always adequate to resolve issues without further discussion and written communication. The team believes that increased communication with the applicant is needed to address this issue.

The process used for handling RAIs and RAI responses varied amongst the PMs and issues arose with the timeliness of issuing RAIs and receiving RAI responses. The team believes that additional attention is needed in this area through better tracking of RAIs and NRC management support for applicant accountability for timely RAI responses.

Recommendations:

- RLEP-A should establish clear expectations for PMs handling of RAIs and RAI responses. This should include: (1) the establishment of firm cut off dates for issuing RAIs and applicants RAI responses (e.g., within 30 days of final RAI issuance); (2) enhanced tracking and screening of RAIs received from RLEP-B project teams and technical reviewers to minimize duplicate or unnecessary RAIs; (3) periodically reviewing RAIs for inclusion in the LRA sufficiency review check list.

- The technical reviewers should develop SER input with corresponding place holders which focuses the development of their RAIs.

4.4 Project Team Composition

During the pilot effort it was not uncommon for there to be 10-12 staff members on the project team. As with most new processes, there is a tendency to over allocate resources during the development and implementation of new process. The pilot plant project teams consisted of RLEP-B staff responsible for leading the project teams, DE technical reviewers observing the audits and providing technical support, contractors responsible for conducting the majority of the audit activities, RLEP-B staff involved in orientation/training for future audits, and RLEP-A staff conducting limited audit activities and providing project management support. While expected during the learning period of the pilot effort, sustaining this level of resource support would seriously challenge the budget and planning assumptions for LRA reviews.

RLEP staff recognized this and during the 2006/2007 budget process the staff reviewed the resource allocations for project teams. As a result, a new budget model was developed which reflects more realistic resource needs to complete audit activities. The project teams are now

comprised of a RLEP-B team leader, RLEP-B assistant team leader and five contract engineers covering different engineering disciplines (e.g., materials, structural, mechanical). This appears to be the appropriate level of support.

The use of contractors has allowed DE technical staff resources to be better focused on more safety significant and reactive type operating reactor issues. Yet, we believe there is still a benefit to their participation in onsite audits. Onsite audits are a more effective and efficient way of obtaining information to support staff reviews. In addition, the onsite audits provide an excellent opportunity to meet our human capital goal of sustaining the technical competence of the NRC's workforce and enhancing its effectiveness in achieving the mission. The level of support must be committed early enough in the process to ensure the adequacy of the project team composition. The Electrical and Instrumentation & Controls Branch (EEIB), Section B, Section Chief has recognized the benefit of EEIB staff participating on project teams. EEIB management has committed and scheduled a technical reviewer to participate on each LRA onsite project team**.**

PM support for project team activities has been mixed. Some PMs were active participants, reviewing one or two AMPs, while others have merely observed the audit and interfaced with the applicant on NRC Headquarter staff review issues. We believe PM participation on project teams provides for a better understanding of the audit process through practical experience and enhances their ownership of the LRA review. PMs should participate in project team reviews by observing the audit, reviewing one or two AMPs and some AMR line items (for PMs new to RLEP), and interacting with the applicant on Headquarter staff issues. However, interaction on Headquarter staff issues during the onsite audit should be limited, as it can detract from the applicant's ability to promptly respond to project team issues.

Recommendations:

- The RLEP budget should be adjusted to reflect individuals participating on project teams for purposes of training to support future LRA reviews.

- DE technical reviewer's should be encouraged to participate in audits as a team member assigned to RLEP-B. This assignment includes participating in the audit and writing the necessary input for both the audit report and the SER input.

- Project Managers should participate in on-site audits by observing the audit, reviewing one or two AMPs and AMR line items (for PMs new to RLEP), and interacting with the applicant on headquarter staff issues.

4.5 Schedule & Resources

Although the pilot plant LRAs are still in process, they were far enough into their respective reviews (i.e., issuance of the draft or final SER) to assess the schedule and resource impacts of the improved process.

4.5.1 Schedule

The schedule for completion of the audit process and issuance of the audit report is six months after receipt of the LRA. The schedule for DE completing their assigned portion of the review of Chapter 2 (Scoping & Screening), Chapter 3 (AMPs/AMRs) and Chapter 4 (Time Limited Aging Analyses(TLAA)) and providing draft SER input is 10 months after receipt of the LRA. Meeting these schedules is contingent upon the receipt of a quality LRA and adequate support from the applicant during the review and audit process.

During the pilot plant reviews, the 6 month schedule for issuance of the audit report was not achieved, primarily due to the level of effort to develop and implement the new process with limited prior RLEP and industry experience. Since the pilot effort, the staff and industry have gained considerable experience with the audit process during the subsequent five LRA reviews. However, the staff's ability to meet the six month schedule is mixed and recent concerns with a few applicants ability to support the project teams have been contributing factors.

Similarly, the 10 month schedule for DE draft SER input was not always achieved. Although applicant support was generally good during the LRA reviews, timeliness problems did periodically surface because of issues with RAIs and RAI responses, causing due dates for DE SER input to RLEP to be renegotiated.

The team notes that in all cases, the milestone dates for issuance of the SER with open items and final SER were not missed on the three pilot plant LRA reviews. However, as previously mentioned in the "Staff Documents – SER" section, heroic efforts were needed to meet the milestone date.

Recommendations:

- RLEP-B and DE should enhance their work control processes in order to meet the schedules for providing inputs to the audit report and draft SER.

- RLEP should publish a generic schedule model to external stakeholders which includes the milestones and target dates for audits and inspections.

- RLEP should continue to communicate with industry the importance of a quality LRA, the resource intensity during the first 10 months of the LRA review (e.g. response to technical reviewers and project team RAIs) and the applicant being able to adequately support the technical staff reviewers and project team.

- RLEP contracts should be issued at least one month prior to receipt of a LRA to ensure that the contractor can promptly begin work upon receipt.

- The LRA review schedule model should be re-evaluated to ensure optimum integration of DSSA/DE reviews, DIPM reviews/audits, regional inspections and RLEP-B audits.

- RLEP-A should provide initial work packages for RLEP-B and technical staff review within two weeks of receiving the LRA submittal.

- RLEP-A should establish firm cut-off dates with LRA applicants for accepting information for incorporation into the SER with open items.

4.5.2 Resources

During the original safety review process, DE was budgeted 4.2 full-time equivalent (FTE) per LRA to review the electrical and structural portion of Chapter 2 (Scoping & Screening), 100% of Chapter 3 (AMPs/AMRs) and 100% of Chapter 4 (TLAA). Approximately 70% of the DE budgeted resources were expended on the review of AMPs and AMRs.

Under the improved process, the review associated with Chapter 3 was split between the DE technical reviewers and RLEP-B project teams based on the applicants claim of "consistent with the GALL Report" or use of "past precedent" and the associated work split rules developed by RLEP-A and DE. For the LRAs since the pilot plants, the work split has averaged 30% DE and 70% RLEP-B for AMP and AMR reviews. RLEP-B anticipates that its percentage of the work split will increase as updates in the GALL Report (scheduled for final issuance in September 2005) result in LRAs with a higher percentage of AMPs and AMRs that are consistent with the GALL Report. The two most recent LRAs submitted in March 2005, Monticello Nuclear Power Plant and Palisades Nuclear Plant, support this trend.

Table 2 provides the DE/RLEP-B AMP/AMR work split for the pilot plants and two most recent LRA reviews.

Table 2. DE/RLEP-B Work Split for LRA Reviews

LRA	AMPs		AMRs	
	DE Review	RLEP-B Project Teams Review	DE Review	RLEP-B Project Teams Review
Farley	33%	67%	49%	51%
ANO-2	18%	82%	37%	63%
D.C. Cook	35%	65%	35%	65%
Monticello	15%	85%	5%	95%
Palisades	21%	79%	1%	99%

Pilot Plant LRAs

Most recent LRAs

The license renewal program was committed in the FY2006-2007 Performance Measures (Effectiveness Goal 4), to achieve an average 5% reduction in license renewal resources for LRA reviews completed in FY2007. In addition, the FY2006-2007 budgets incorporated a new work split assumption for "consistency with the GALL Report" for the LRA Chapter 3 review effort (30% for DE and 70% for RLEP-B). As a result of this 5% reduction and the shift in review effort for AMPs and AMRs from DE to the RLEP-B project teams, DE resources were reduced from 4.2 FTE to 2.0 FTE per LRA, while RLEP-B resources were increased by 2.7 FTE per LRA to support audit activities. This represents a 0.5 FTE increase in the total resources previously budgeted for the review of the AMPs and AMRs in Chapter 3. Based on a historical review of resource expenditures for the three pre-audit plants (Robinson, Summer and Ginna) and GALL

Report audit plants (Farley, ANO-2, D.C. Cook, Millstone and Point Beach), this added cost was offset by corresponding resource reductions in other areas of the LRA review process.

The goal of the improved process was to implement a review process that was more effective to accommodate the large number of LRAs under review. Additionally, RLEP expected that additional resource reductions were achievable for DE and RLEP-B. As more LRAs are submitted with expected increase in consistency with the GALL Report and RLEP-B capitalizes on their audit process experience, the team believes there should be further efficiencies. However, further resource reductions should wait until after a reassessment of the final resource expenditures are compiled for the pilot plants, plus Millstone and Point Beach LRA reviews, and an evaluation of the resource trend.

In light of the reduced scope of work and the corresponding reduction in budgeted resources, the team believes a reduction of 2 months from the DE review schedule is also warranted. We believe an eight month review period appropriately reflects the reduced scope of work, while still providing enough flexibility for DE staff to respond to emerging plant operational issues and other licensing related work.

Figures 1 and 2 provide a comparison of resource expenditures for the original review process and the improved process. Note that in addition to implementing a revised work flow process, the resources for the improved process reflect a 5% reduction in total resources compared to the original review process.

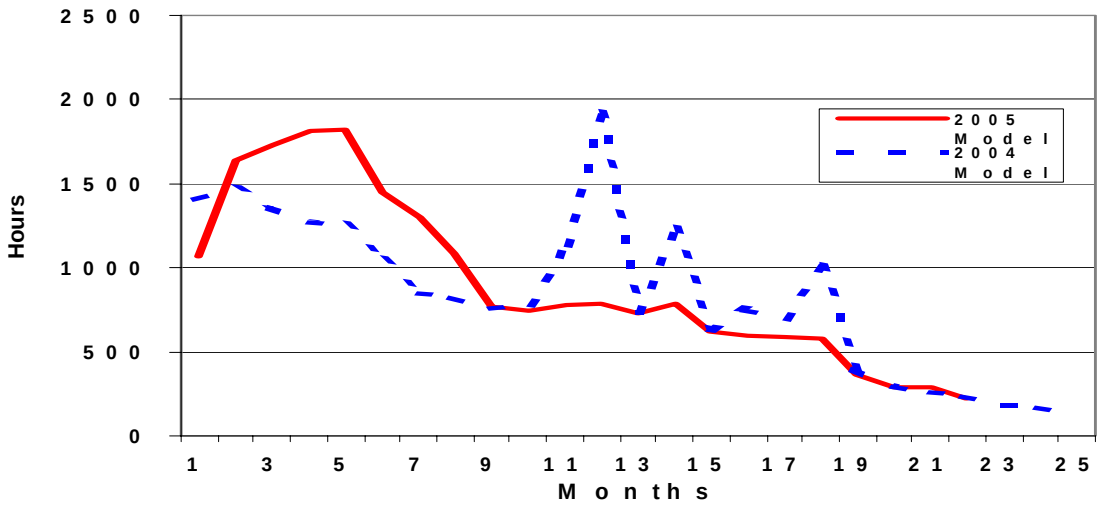

Figure 1. Equivalent Staff Hours - Monthly Expenditure Rate

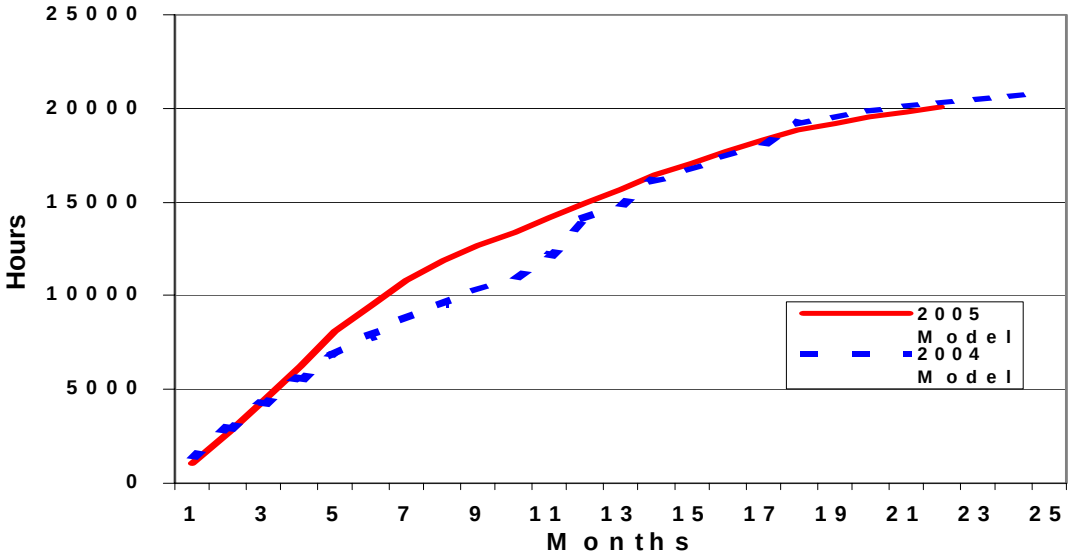

Figure 2. Cumulative Equivalent Staff Hours

Recommendations:

- The NRR Process Standard for License Renewal and LRA Process Model should be updated to reflect the current review process, along with adjusting the schedule, work assignments, and budget assumptions accordingly.

- The Work Planning Center (WPC) should prepare individual LRA "budget vs. actual" resource reports that show monthly and cumulative section, branch, division and NRR expenditures for each LRA, including both NRC staff hours and contract dollars. RLEP-A should use these reports to identify out of standard resource expenditures and identification of areas for appropriate management action.

- The LRA review model should be modified to reflect a 2 month reduction in the DE review schedule from 10 months to 8 months.

- LRA resource allocations should be evaluated during the next budget cycle to reflect the current trend of the aging management work assignments for RLEP-B and the technical reviewers.

- RLEP-B should review the scope and depth of their audit activities to determine if there are additional efficiencies that can be implemented.

4.6 Training

On-the-job training is the primary means for learning the various PM and technical review responsibilities of the LRA review process. While certainly an effective method, it should not be relied upon solely, but instead should be augmented with more targeted training on a periodic

basis. In addition, the improved process has evolved during the pilot plant and subsequent LRA reviews such that refresher training is warranted for technical staff, project team members, including contractors, and PMs.

Recommendations:

- RLEP should continue to conduct initial and refresher training for individuals responsible for the conduct of LRA reviews. The training should cover the evolution of the improved process, regulatory requirements, guidance documents, and expectations for performing reviews. OGC should be invited to discuss their expectations for draft SER content, including legal requirements and necessity for the technical basis in staff's conclusions.

4.7 Other Areas

The following are recommendations for improvement in other areas of the License Renewal Program that were identified while performing this assessment.

Recommendations:

- RLEP-A PMs should continue to ensure that the DIPM methodology audit is appropriately coordinated with DSSA in order to allow for a DSSA representative to participate in the onsite audit. This allows for the following: (1) increased understanding of the methodology; (2) onsite interaction with the applicant to resolve potential issues; and (3) the ability to review onsite information such as design basis documents, topical reports, and system information. The region should also be offered an opportunity to participate.

- Once the updated GALL Report is issued in September 2005, RLEP should develop and implement database for tracking all "exceptions to the GALL Report." The database should include the bases for acceptance/denial and an evaluation of consideration for updating the GALL Report. This database would be very useful for staff review of future LRA reviews that reference previous exceptions and cataloguing future updates to the GALL Report. The database should be put on a CD-ROM so the project teams can take them to the site.

- RLEP should conduct a feasibility study to determine if a GALL Report-like document can be developed for scoping and screening based on past plant reviews and used by a similar AMP/AMR on-site project team.

5. CONCLUSION

The team concluded that the improved process is a success because it: (1) provides for the verification of a applicant's "consistent with the "Generic Aging Lessons Learned (GALL) Report" claim in their respective LRAs; (2) effectively manages the increase in the number of LRA reviews while allowing DE resources to be better focused on more safety significant operating reactor issues (i.e., Davis-Besse Lessons-Learned, materials degradation); (3) allows NRC staff and applicants to better focus their resources on those RAIs and their associated responses that are needed to support the staff's evaluation.

The team believes that the combination of the improved process and updates to the GALL Report and SRP-LR, scheduled for issuance in September 2005, should further enhance the effectiveness and efficiency of the overall LRA review process.

In addition, industry feedback on the three pilot plant reviews using the improved process has been positive. The pilot plant applicants and NEI have indicated during staff discussions that the face-to-face interaction with the project teams is a more efficient way of resolving issues and the need to send RAIs is greatly reduced. The industry anticipates further efficiency gains as lessons are learned and applied to the process.

Since the pilot plant reviews, the DE and RLEP staff have continued to work on improving the process for subsequent LRAs, making adjustments based on their experience and feedback. We commend them for their effort and believe that additional improvements are achievable as outlined in this report.