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Docket No. 50-440
Docket No. 50-441

The Cleveland Electric Illuminating
Company
ATTN: Mr. Michael D. Lyster
Vice President
Nuclear - Perry
10 Center Road
Perry, OH 44081

Gentlemen:

SUBJECT: NRC REGION III ALARA TEAM ASSESSMENTS

As you are aware, an important aspect of nuclear power station operations is the effort to maintain occupational radiation doses as low as reasonably achievable (ALARA). Our inspectors routinely inspect this aspect of your operations during their inspections. In addition to these routine inspections, Region III undertook more extensive team assessments of nuclear power station ALARA programs at two Region III facilities last year. These assessments noted licensee ALARA implementation strengths, as well as areas which appeared to warrant improvement. The licensees' responsiveness to the identified improvement items are expected to improve ALARA performance at those facilities.

While we intend to continue our ALARA assessment efforts, the number of these assessments will be limited due to their extensive resource requirements. Therefore, to provide you timely information concerning findings from these ALARA assessments, which may be of use in the implementation of your ALARA program, we are forwarding the two reports of the ALARA team assessments we conducted at the LaSalle County Nuclear Generating Station in April 1990 and at the Palisades Nuclear Power Plant in May 1990. Also enclosed is the procedure the assessment team used to conduct the most recent ALARA assessment. This procedure was developed specifically for these assessments, and is expected to be modified based on experience gained during its continued usage.

We are not requesting any licensee action in response to this letter. The attached documents are being supplied to you only for information. If you

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have any questions on the r sults of either inspection or the procedure, please contact Dr. Charles F. Gill of my staff at (708) 790-5261.

Sincerely,

Charles E. Norelius, Director
Division of Radiation Safety and Safeguards

Enclosures: As stated

cc w/enclosures:
F. R. Stead, Director, Nuclear Support Department
R. A. Stratman, General Manager, Perry Nuclear Power Plant
R. A. Newkirk, Manager, Licensing and Compliance Section
S. F. Kensicki, Director, Perry Nuclear Engineering Dept.
H. Ray Caldwell, General Superintendent Nuclear Operations
DCD/DCB (RIDS)
Licensing Fee & Debt Collection Branch
Resident Inspector, RIII
Terry J. Lodge, Esq.
James W. Harris, State of Ohio
Robert E. Owen, Ohio Department of Health
A. Grandjean, State of Ohio, Public Utilities Commission
Clinton SRI

RIII	RIII	RIII	RIII
Gill/da	Greger	~~Miller~~ Knop	~~Norelius~~
3/19/91	3/27		3/28/91

JUL 2 [illegible] 1990

Docket No. 50-255

Consumers Power Company
ATTN: David P. Hoffman
Vice President
Nuclear Operations
1945 West Parnall Road
Jackson, MI 49201

Gentlemen:

This refers to the special team assessment conducted by Mr. C. F. Gill and other NRC and contractor personnel on May 13-31, 1990, of activities at the Palisades Nuclear Generating Plant authorized by NRC Provisional Operating License No. DPR-20 and to the discussion of our findings with you and others of your staff at the conclusion of the inspection.

The assessment was conducted to evaluate the effectiveness of licensee actions to keep radiation doses at the Palisades Plant as low as reasonably achievable (ALARA). The historically high collective radiation dose incurred at the Palisades Plant prompted this assessment. The team used selective examinations of procedures and representative records, interviews with personnel, independent measurements and observations of activities in progress to perform the evaluation.

Within the scope of the assessment, no violations or deviations were identified. However, a number of weaknesses, which are discussed in detail in the enclosed report, were identified which in our view contributed to your historically high radiation dose at Palisades. During our meeting on July 18, 1990, you described actions that you have initiated to address many of these identified weaknesses. We also are aware that you are conducting your own self assessment of your health physics program. As we discussed, after you have completed your evaluation of this report and after completion of your self-assessment, we would like to meet with you again to discuss the progress of improvements in your health physics/ALARA programs. We will contact you to set up the meeting in early September.

In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of this letter and its enclosures will be placed in the NRC Public Document Room.

We will gladly discuss any questions you have concerning this assessment.

Sincerely,

Charles E. Norelius, Director
Division of Radiation Safety
and Safeguards

Enclosures:
1. Executive Summary
2. NRC Inspection Report
No. 50-255/90013(DRSS)

cc w/enclosures:
Mr. Kenneth W. Berry, Director
Nuclear Licensing
Gerald B. Slade, General Manager
DCD/DCB (RIDS)
Licensing Fee Management Branch
Resident Inspector, RIII
James R. Padgett, Michigan Public
Service Commission
Michigan Department of
Public Health

bcc: R. R. Bellamy, NRC RI
D. M. Collins, NRC RII
B. Murray, NRC RIV
G. P. Yuhas, NRC RV
C. S. Hinson, NRR, PRPB
T. F. Dragoun, NRC RI
L. L. Coblentz, NRC RV
B. T. Dionne, BNL
J. Baum, BNL
R. E. Utting, AECB

RIII
Paul/gmd/mj
Gregger
7/6

RIII
Kunowski
Norelius
7/20/90

Yes
RIII
Markley
7/13/90

yes
RIII
Gill
7/12/90

yes
RIII
Snell
7/12/90

RIII
Burgess

EXECUTIVE SUMMARY

In 1988 the annual collective radiation dose at the Palisades Nuclear Generating Plant was more than twice the national average for Pressurized Water Reactors (PWRs). Including 1988, the Palisades plant was above the U.S. PWR average dose for 10 of the last 13 years. A special radiological team inspection conducted at Palisades during late 1988 (Inspection Report No. 50-255/88021(DRSS)) concluded that although the licensee incurred much of the 1988 radiation exposure on unanticipated outage work and on unusually extensive or one-time modification/maintenance activities, work planning deficiencies appeared to have contributed to the high dose. Also, because of initial poor plant system design and previous poor operational and maintenance activities, the plant had been plagued with hot spots and relatively high general area radiation fields which impacted the dose. It was also concluded that although the licensee had implemented a radiation source reduction program three years before, it had not been as effective as anticipated and that much additional effort appeared necessary to adequately reduce personnel exposure. At a meeting with NRC regional management on December 8, 1988, the licensee indicated, in part, that planned improvements in the ALARA program were expected to significantly improve future dose saving efforts.

The collective dose for Palisades declined from 730 person-rem in 1988 to 294 person-rem in 1989. This value is expected to be about the same as the national average for PWRs; however, the lack of a Palisades refueling outage in 1989 significantly contributed to the decline in annual collective dose. The annual dose goal for 1990 at Palisades was established at about 1200 person-rem which includes about 700 person-rem allotted for the Fall steam generator replacement project (SGRP). Because of past high dose expenditure and the high-dose jobs anticipated during the Fall 1990 SGRP/ refueling outage, the NRC concluded it was appropriate to conduct another special review of the Palisades ALARA program.

During the period of May 13-31, 1990, a special team assessment was conducted by the NRC to evaluate the licensee's efforts for maintaining occupational radiation doses as low as reasonably achievable (ALARA). The assessment included a review of the causes of the past high radiation doses; an evaluation of the licensee's current organization and program for keeping radiation doses ALARA; a review of past and current licensee initiatives to bring the radiation doses to within industry norms; and an evaluation of licensee management's awareness of, involvement in, and support for the ALARA program.

The team identified ALARA program weaknesses which indicate that a broadscope, proactive ALARA implementation improvement plan should be initiated by the licensee. The identified weaknesses included:

- Although the team noted that management support of the ALARA program was evident through such mechanisms as the Scope Control Team and the ALARA Committee, the lack of an overall management-directed ALARA improvement plan appeared to contribute toward inconsistent levels of ALARA awareness and differing levels of involvement in ALARA initiatives among various station groups.

- ALARA considerations were not well integrated into work planning activities.

- Weak procedures governing ALARA activities appeared indicative of a lack of firm ALARA commitment.

- With some notable exceptions, there appeared to be a cultural attitude that ALARA activities and concerns were solely the responsibility of the Radiological Services Department (RSD).

- ALARA concepts have not been fully incorporated into the training program, including general worker and radiological safety technician training lesson plans and procedures.

In addition to the above concerns, the team had concerns regarding the RP/ALARA readiness for the steam generator replacement project (SGRP)/refueling outage scheduled for mid-September 1990. The inspectors concluded that not only would the licensee have difficulty in significantly improving the plant ALARA program before the SGRP, but the licensee might also have difficulty in adequately addressing the following ALARA concerns before the outage.

- The licensee had not developed corrective action assignments and schedules to resolve internal recommendations and lessons learned from the 1988 refueling outage.

- The licensee's self assessment of the RP/ALARA program, begun in February 1990, is not scheduled for completion until August 1990. ALARA corrective actions had not been assigned and scheduled for implementation during the Fall 1990 outage.

- SGRP RP/ALARA organizational structure, assignments, duties, responsibilities, authority and interface with the plant RP/ALARA organization had not been determined. Numerous similar projects at other facilities had delineated these organizational/managerial functions much earlier in the planning stage.

Subsequent to the team inspection, the licensee informed Region III that an implementation plan to ensure RP/ALARA readiness for the Fall 1990 SGRP/refueling outage, as well as a long-term improvement plan, has been developed. A meeting is scheduled on July 18, 1990, to determine RP/ALARA readiness for the Fall 1990 outage.

Several program strengths were also identified and are summarized as follows:

- Dose savings have been achieved for certain repetitive high-dose jobs.

- Superintendents have been involved in setting annual dose goals for 1990 and have established additional "exceptional" target levels.

- The quality of post-job ALARA reviews has been good.

- The ALARA staff is proactive and conscientious. The ALARA/refueling engineering interface appears to be working well. Also, the assignment of some RWP/ALARA personnel to various project work groups to expedite RWP preparation and ALARA reviews appears to be a positive initiative.

- Use of the Five-Year Plan for planning long-term, large-capital ALARA initiatives has been beneficial.

- Improved design and electro-polishing of new steam generators is indicative of positive actions to reduce future dose.

- The surrogate tour system is a useful training and familiarization tool.

- Contractor fees have been tied to ALARA performance. Further monetary incentives have been developed to elicit worker ALARA suggestions and to induce department managers to meet annual department ALARA goals.

- A comprehensive self assessmert of the ALARA program is underway.

A more detailed listing of both strengths and improvement items are set forth in each section of the report details.

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-255/90013(DRSS)

Docket No. 50-255 License No. DPR-20

Licensee: Consumers Power Company
212 West Michigan Avenue
Jackson, MI 49201

Facility Name: Palisades Nuclear Generating Plant

Inspection At: Palisades Site, Covert, Michigan

Inspection Conducted: May 13-31, 1990

Inspectors: C. F. Gill, Team Leader — Date: 7/12/90

R. A. Paul, Team Member — Date: 7/12/90

M. A. Kunowski, Team Member — Date: 7/13/90

T. F. Dragoun, Team Member — Date: 7/12/90

Accompanied By: A. W. Markley, Team Member
L. L. Coblentz, Team Member
B. J. Dionne, Team Member

Approved By: W. G. Snell, Chief — Date: 7/12/90
Radiological Controls and
Emergency Preparedness Section

Inspection Summary

Inspection on May 13-31, 1990 (Report No. 50-255/90013(DRSS))
Areas Inspected: Special, announced assessment of the ALARA program (IP 83728).
Results: The licensee has implemented a generally adequate ALARA program, that with further development has the elements necessary to become a good

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program. However, there were many areas identified where actions could be taken to improve the program. Some of the areas where improvement could be achieved included training, dose reduction for major job tasks, corporate and management support, ALARA involvement in planning, ALARA awareness and initiatives and ALARA procedures. No violations or deviations were identified.

DETAILS

1. Persons Contacted

Consumers Power Company

J. Alderink, Industry Experience and Assessment Administrator
C. Axtell, Health Physics Consultant
R. Beeker, Audit Supervisor
E. Bogue, ALARA Coordinator
J. Brunet, Senior Licensing Analyst
J. Fontaine, Senior Health Physicist
K. Haas, Radiological Services Manager
J. Hadl, Senior QA Consultant
J. Hanson, Operations Superintendent
D. P. Hoffman, Vice President, Nuclear Operations
D. W. Joos, Vice President, Energy Supply Services
M. Lesinski, SGRP Health Physics Manager
R. McCaleb, QA Director
M. Mennucci, Senior Health Physicist
R. Orosz, Engineering and Maintenance Manager
C. Plachta, Senior HP Technician
J. Pomaranski, Site Projects Manager, ESS
G. Slade, Plant General Manager
G. Smith, Senior Nuclear Operations Analyst
D. VandeWalle, Technical Director

Nuclear Regulatory Commission, Region III

B. Burgess, Chief, Reactor Projects Section 2A
L. Greger, Chief, Reactor Programs Branch
W. Snell, Chief, Radiological Controls and Emergency Preparedness Section
E. Swanson, Senior Resident Inspector

The above persons attended the exit meeting on May 31, 1990. Additional licensee personnel were contacted during the course of the inspection.

2. Dose Evaluation

a. Introduction

This ALARA assessment was prompted, in part, by the high annual collective dose experienced in 1988 at the Palisades Plant. As part of this assessment, an analysis of the licensee's radiological dose data was performed in an attempt to identify the potential causes for the elevated collective dose, as well as to evaluate the effectiveness of the licensee's efforts to reduce dose at Palisades. The inspection also included a systematic review of the major elements of the licensee's ALARA program and an evaluation of the effectiveness of its implementation.

b. Collective Dose

The collective dose from 1986 to 1989 for Palisades was compared with that for the average U.S. Pressurized Water Reactor (PWR). In 1986, Palisades was 63% above the average collective dose for PWRs. This decreased in 1987 to +12% and in 1988 increased to +117%. The collective dose for Palisades dropped from 730 in 1988 to 294 person-rem in 1989. This value is expected to be about the same as the average collective dose for PWRs in 1989. Palisades collective dose ranked 8th highest out of 59 PWRs in 1986, 13th out of 64 PWRs in 1987, 4th out of 68 PWRs in 1988, and is expected to rank near the middle of 72 PWRs in 1989. (See Attachment 1, Item A)

c. Average Individual Dose

A review of the average individual dose was performed for the period 1986 to 1989. Palisades average individual dose was 20% above the average annual dose for PWR radiation workers in 1986, - 2% in 1987, and +39% in 1988. The average individual dose decreased in 1989 at Palisades to 286 mrem/yr, which is expected to be slightly lower than the average individual dose at U.S. PWRs. (See Attachment 1, Item B)

d. Daily Collective Dose

A review of the daily collective dose was performed to determine if the average daily dose being expended during non-outage and outage periods was higher than that at other PWRs. Palisades daily collective dose per reactor was 121% higher than other PWRs during non-outage periods and 39% lower during outage periods. (See Attachment 1, Item C)

e. Exposure Rates

In an attempt to determine if the increased collective dose was due to higher than average exposure rates, a comparison was performed of Palisades' steam generator tube sheet shutdown radiation levels with those from other Combustion Engineering (CE) PWRs. Attachment 2 is a figure which makes this comparison for the period from 1971 to 1978. At present, steam generator tube sheet radiation levels at Palisades are 4 to 7 R/hr at contact. A review of this information indicated that Palisades radiation levels inside the steam generators are, in general, lower than those presented for CE PWRs in Combustion Engineering Report No. NPSD-69 entitled "Dose Rate & Man-Rem Measurement Program." It should be noted that this comparison is cursory, and does not include other work location radiation levels. Therefore, caution should be exercised so as not to construe these results as definitive.

f. Repetitive High-Dose Jobs

To further identify the potential causes for the elevated collective doses, a review of the repetitive high-dose jobs that were conducted during outages and during routine operations was performed. The collective doses for Palisades repetitive high-dose jobs from the 1983, 1985, and 1988 refueling outages were compared against those reported in NUREG/CR-4254 (Attachment 3, Item A). Only ten of the 25 values reviewed for high-dose jobs during refueling outages were above the average values for CE-PWRs. In general, high-dose jobs were near or below the average values for repetitive refueling outage high-dose jobs.

The trend in the total collective doses for outage repetitive jobs was compared against the average total collective dose for these same jobs at CE-PWRs as reported in NUREG/CR-4254. The average for CE-PWR repetitive high dose jobs conducted during outages totaled 320 person-rem. Palisades expended 390 person-rem during the 1983 RFO, 190 during the 1985 RFO, and 170 during the 1988 RFO. This indicates that Palisades has been successful in reducing repetitive high dose jobs conducted during refueling outages.

The collective doses for Palisades repetitive high-dose jobs conducted during routine operations and outages during 1985 - 1989 were compared against those reported in NUREG/CR-4254 (Attachment 3, Item B). Twenty-three out of thirty values reviewed for repetitive high-dose jobs during routine operations and outages were above the average values for CE PWRs. This indicates that repetitive high-dose jobs conducted during routine operations may account for a portion of the above average collective dose at Palisades.

The trend in the total collective doses for repetitive high dose jobs conducted during outages and routine operations was compared against the total collective doses for these same jobs at CE-PWRs, as reported in NUREG/CR-4254. The average total for CE-PWRs was 60 person-rem. Palisades expended 200 person-rem during 1985 and 1986, 170 during 1987, 150 during 1988, and 78 during 1989. Although a downward trend has been achieved, additional effort is required to reduce these repetitive job exposures below the referenced CE-PWR industry averages.

ALARA post-job review records were examined to identify problems encountered and the corrective actions identified for these repetitive high-dose jobs. The inspectors also discussed with licensee personnel the licensee-identified problems, and corrective actions taken or planned. In addition, the various dose and contamination reduction techniques found in Appendix B of NUREG/CR-4254 were discussed. The inspectors concluded that the post-job review process has generally resulted in the identification

of significant problems which are usually resolved in a timely manner with appropriate corrective actions. The downward trend in dose for most of these high-dose jobs demonstrates the effectiveness of the licensee's efforts.

g. Non-Repetitive High-Dose Jobs

A review of the non-repetitive high-dose jobs was performed to determine if the large amount of non-routine ork resulted in the high exposures incurred in 1986 through 1989. Because special maintenance activities constitute the largest work function dose category for U.S. PWRs (NUREG-0713) and are generally non-repetitive, these activities at Palisades were compared to the average U.S. PWR. The collective doses for special maintenance in 1986 - 1989 are shown in Attachment 4 Items A and B for Palisades and the U.S. PWR average, respectively. Subtracting these totals from the plant collective doses yields the adjusted collective doses shown in Attachment 4.

These adjusted totals indicate that Palisades collective dose in 1986 was 133% above the average PWR, +40% in 1987, +190% in 1988, and will likely exceed the average in 1989. The average annual percent of the collective dose for special maintenance during 1986-1989 at Palisades was 14%, compared to 32% for the average U.S. PWR during 1986-1987. Based on data comparisons and interviews with plant staff, the inspectors concluded that the licensee's elevated doses are not a result of special maintenance activities.

h. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA program.

Strength: Efforts to reduce doses for certain repetitive high-dose jobs have been relatively successful.

Improvement Item: Conduct continuing comparisons of radiation dose data at Palisades with that for the average U.S. PWR to identify areas where improvement is warranted, and implement corrective actions as appropriate to reduce doses.

3. ALARA Program/Organization

a. Introduction

The licensee implemented a program to maintain occupational exposure as low as reasonably achievable (ALARA) when the ALARA policy statement contained in the Nuclear Operations Department Radiation Safety P an (Parts 2 and 3) was issued in 1981. The requirements and guidelines of the plan are specified by Corporate Nuclear Operations Department Standard No. NODS-H01, "Health Physics Standard." The first ALARA Committee meeting was convened at the

Palisades Nuclear Generating Plant on April 21, 1981. The corporate ALARA Engineer and station ALARA Coordinator positions were established in August 1981. A procedure for performing an ALARA job review was implemented in August 1982. A procedure for incorporating ALARA design considerations into major and minor modifications was implemented in 1985.

b. ALARA Program

The station's ALARA program is described in Palisades Administrative Procedure No. 7.02, Revision 3, "ALARA Program" and is implemented by two ALARA groups within the Radiological Services Department (RSD). The procedure was written to establish policies, goals, and standards to reduce total personnel radiation exposure at Palisades in accordance with Section V, Part 3, "ALARA Program," of the corporate Radiation Safety Plan. The adequacy of the procedure is discussed in Section 7. The Radiation Safety Plan was developed and is maintained by the Corporate Health Physicist to satisfy corporate Standard No. NODS-H01. Notwithstanding the corporate Radiation Safety Plan and Standard, an explicit, written endorsement of ALARA from corporate management is lacking. This matter and corporate involvement in the ALARA program, in general, are discussed further in Section 4.

The ALARA program for the Steam Generator Replacement Project (SGRP) was briefly reviewed. At the time of the inspection, the SGRP ALARA group was generally operating under the station's ALARA program procedure, with additional guidance provided by certain policies developed by the SGRP ALARA group. These policies are part of the SGRP draft Project Radiological Plan, which is intended to augment station radiation protection procedures and to provide additional, project-specific guidance. At the time of the inspection, the Plan had not been approved pending licensee decisions regarding SGRP RP/ALARA organizational structure, assignments, duties, responsibilities, and authority. Discussions with the SGRP ALARA Coordinator and the SGRP HP Manager, both with prior experience in similar positions, and a review of the draft Plan and a draft RSD-SGRP interface document developed by the SGRP radiation protection group indicated that the SGRP ALARA program should be adequate for the SGRP if implemented as planned.

At the end of the inspection, the licensee stated that an RP/ALARA organization structure for the SGRP had been adopted, and that the RSD and the SGRP contractor RP group would meet in early June to assign personnel to the adopted organization, determine needs for procedure revisions, establish schedules and milestones, and develop an interface agreement.

c. Organization and Staffing

Prior to December 1989, there was only one RSD ALARA group, consisting of an ALARA Coordinator and 3-4 senior radiation safety technicians (RSTs) during normal operations, and augmented during major outages with several contractor technicians. The ALARA Coordinator reported to the Health Physics (HP) Superintendent, who reported to the RSD Manager. The major duties of the group were the traditional ALARA activities and the preparation of all Radiation Work Permits (RWPs). In December 1989, the licensee reorganized the RSD, reassigning the ALARA Coordinator from day-to-day operational activities to the responsibility for long-term ALARA and outage planning, the source term reduction program, and liaison activities between RSD and the SGRP RP/ALARA group. In the new organization, the ALARA Coordinator was assigned three experienced RSTs and reports directly to the RSD Manager. The day-to-day activities, such as RWP preparation and ALARA job reviews, are now the responsibility of the Nuclear Operations Analyst (ALARA Operations Supervisor), who reports to the HP Superintendent and is assisted by 3-4 experienced RSTs.

During the current maintenance outage, the Operations ALARA Analyst functioned as a Duty Health Physicist. His responsibilities in the ALARA group were assumed by an RST, and additional attention to the day-to-day operations was also given by the ALARA Coordinator. This practice of re-assigning ALARA personnel during an outage may detract from the effectiveness of the ALARA Operations Supervisor and ALARA Coordinator positions. Also during the outage, two contractor RSTs were added to the day-to-day ALARA operations staff.

The overall quality and experience of the ALARA personnel appear generally good. However, problems with the job history files, inaccurate task-related dose estimates, and the use of a 3 person-rem minimum limit for initiating an ALARA review compared to the nominal industry limit of 1 person-rem (see Section 7) may indicate that the station ALARA groups are understaffed. (Licensee personnel interviewed stated that the existing staff had not had time to adequately address these matters.)

Discussions with the licensee and a review of procedures indicated that the ALARA Program procedure and Palisades Administrative Procedure No. 7.00, Revision 6, "Radiological Services Department Organization and Responsibilities," have not been revised to describe the new organization and reassigned responsibilities. Informally, the ALARA Coordinator and the Operations ALARA Supervisor have discussed the matter and have demarcated areas of responsibilities. The lack of procedural guidance in this area apparently has not caused significant problems to date but is a weakness that should be corrected to ensure that concerns are promptly addressed by the responsible staff person.

As discussed above, the inspectors reviewed the SGRP ALARA program, including organization and staffing. At the end of the inspection, the licensee had tentatively established an RP organization for the combined refueling outage and the SGRP. The organization will

consist of two basically separate groups, with the RSD responsible for refueling activities and the SGRP RP/ALARA group responsible for steam generator replacement activities; however, the station duty HP will have definitive decision-making authority over all day-to-day containment activities. The SGRP ALARA Coordinator and the RP Manager have extensive experience, including participation in the steam generator replacement project at D.C. Cook and the recirculation piping replacement project at Dresden. In addition, the station ALARA Coordinator and two experienced station technicians have been detailed to the SGRP ALARA group, and two experienced contractor technicians are employed by the main contractor for the SGRP to provide initial review of work packages for radiation protection concerns.

d. ALARA Program Support and Incentives

Notwithstanding the lack of an explicit written endorsement of ALARA from corporate management, financial support of ALARA efforts was evident and has increased significantly since 1986 (the long-term plan for budgeting ALARA improvement items is included in the licensee's Five-Year Plan). Examples of several large-capital initiatives undertaken by the station are discussed in Section 9. Non-financial support was also evident. Attendance of the Corporate Health Physicist and station upper management at the monthly ALARA Committee meetings has been good. Discussions with the licensee and a review of meeting minutes indicated the Committee was fulfilling its intended functions, including reviewing progress towards exposure goals. However, further improvements in documentation of meeting discussions could be made; these improvements began in mid-1989 when a new secretary was appointed to the Committee. Minutes for the station ALARA Subcommittee, composed of first-line management and workers from various station departments, were also reviewed. Discussions with the licensee and the review of meeting minutes indicated the Subcommittee was fulfilling its intended function. The inspectors attended a Subcommittee meeting; however, because a quorum was not in attendance, the meeting was rescheduled. This incident was isolated; attendance at previous meetings was good.

An ALARA Committee for the SGRP has been established with representatives from the station and SGRP upper management and radiation protection groups to review SGRP ALARA concerns and to advise SGRP and station managers on these concerns. The Corporate Health Physicist is also a member. The Committee is scheduled to meet monthly until the outage activities begin in mid-September 1990, when the meetings will be held weekly. Discussions with the licensee and a review of minutes for the two meetings held to date indicated the Committee was meeting its intended function.

Additional indication of management support of and worker participation in the ALARA program was observed in an active ALARA suggestion program and a "Cost Chopper" program. Awards of nominal value are given for beneficial ALARA suggestions. ALARA suggestions that may

result in significant person-rem savings are usually directed to the "Cost Chopper" program by the ALARA staff to maximize the incentive to workers. Cash/stock awards are given for beneficial ideas submitted to this program. In addition, annual cash bonuses for upper station managers are dependent on the success of the managers' work groups in meeting annual dose goals (discussed further in Section 6), and other station personnel involvement in the ALARA program is bolstered through evaluation of employee efforts to minimize personal radiation exposure during annual employee performance appraisals. The SGRP radiation protection group plans to use the station's ALARA suggestion program.

e. Plant Tours

No significant instances of poor ALARA work habits were observed by the inspectors during tours of the plant. During review of work-in-progress in a high radiation area, a minor problem with the adequacy of protective clothing was observed by the inspectors. The problem was quickly corrected by the licensee. Dose rates measured by the inspectors during the tours were in agreement with licensee survey records and postings.

The inspectors also toured the licensee's recently expanded solid radioactive waste (radwaste) shipping facilities. Formerly, radwaste shipping activities were conducted in two separate buildings. Discussions with the licensee indicated that the Radwaste Shipping Coordinator was involved in the design of the expanded facilities, which now includes additional permanently shielded storage areas for high dose primary system filters, resins, and evaporator bottoms; an enclosed work area and dedicated wood planing equipment for decontaminating scaffolding; a "super" box compactor for compacting dry active waste in 97 ft^3 metal boxes; and a remote tool for high-integrity container lids. The Radwaste Shipping Coordinator stated that the expanded facilities are expected to result in a 2-3 person-rem savings per year for the Radwaste shipping group.

The inspectors also reviewed RWPs maintained at the entrance to the main radiological controlled area (RCA). No major problems were identified with the RWPs; however, several minor problems, relating to general quality control of RWPs, were noted. RWP P900104 contained an ALARA Pre-Job Checklist that referred to an attached memo dated 3-11-87; however, this memo was not attached to the RWP. In addition, the "Radiation Work Plan" attached to the RWP incorrectly specified two pairs of plastic shoe covers and one pair of cloth shoe covers; the RWP specified one pair of nylon booties and one pair of rubber overshoes. RWP P900404 specified that informal or formal prejob briefings were required; however, no criteria were specified in the RWP or in station procedures for determining which type of briefing was required. RWP P900502 contained an illegible Pre-Job Checklist and copies of several pages of the health physics desk log. The copies of the log did not highlight the entry or entries pertinent to

the RWP. SGRP RWPs P900701 and P900702 contained several pages of information related to generation of the RWP by the work group that were unnecessary for workers using the RWP. The problems with the RWPs were discussed with licensee representatives, who agreed that additional quality control was necessary.

f. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA program.

Strengths:

- Station ALARA and SGRP RP/ALARA personnel are experienced.
- Station upper management and the Corporate Health Physicist regularly attend station and SGRP ALARA committees.
- Use of monetary incentives to elicit worker ALARA suggestions and to induce department managers to meet annual department ALARA goals.

Improvement Items:

- Increase quality control reviews of RWPs.
- Continue documentation improvements in the minutes of the station ALARA Committee.
- Revise station procedures to reflect the new ALARA organization and establish responsibilities for the two RSD ALARA groups.
- A written endorsement of ALARA should be provided by corporate management.

4. Corporate Involvement

The corporate office support for radiological safety consists of one individual, the Corporate Health Physicist. This individual reports directly to the Director of Nuclear Safety and is responsible for 1) implementing the quality assurance program for personal dosimetry, 2) developing and maintaining the NOD Radiation Safety Plan, 3) attending technical meetings and disseminating applicable information and 4) serving as a member of the Nuclear Safety Review Board. A Corporate ALARA Engineer position was established in August 1981, but was eliminated in a 1985 reorganization.

Presently, the corporate office is assigned the following ALARA functions:

- Review relevant dose-reduction research, practices, and modifications performed in the nuclear industry. Disseminate this information to the appropriate individuals within the organization as well as the Palisades ALARA Committee.

- Appraise the effectiveness of the radiation and contamination control programs, e.g., the 1990 Health Physics Self-Assessment.

- Review plant operating occurrences including significant radiological incidents, e.g., exposures in excess of regulatory limits and NRC inspection findings in Radiation Protection.

- Provide basic guidelines for implementation of the ALARA program, i.e., the Radiation Safety Plan and Standard No. NODS-H01.

Overall, the corporate support of the ALARA program appeared broad in scope but only marginally effective because it consisted of only limited involvement by one individual. Considering the collective dose history at Palisades, additional corporate involvement seems warranted.

Improvement Items:

- Issue a corporate ALARA policy statement which reemphasizes management's commitment towards ALARA and line management's responsibility to reduce dose.

- Strengthen and possibly expand the corporate ALARA functions to aid in reducing doses at Palisades.

5. Training

The inspectors reviewed selected licensee training programs regarding presentation and implementation of ALARA policies and procedures for routine and special work activities. Information was collected by interviews with licensee personnel; procedure and policy reviews; review of instructor lesson plans, trainee study guides, and examinations; and tours of onsite and offsite training facilities.

a. General Employee/Basic Radiation Worker Training (GET/BRWT)

Current lesson plans for GET indicated that basic radiation safety and ALARA concepts were appropriately communicated to all new employees, consistent with the requirements of 10 CFR 19.12. Incoming radiation workers are given an additional 1-2 day course in BRWT, which included demonstrating minimal proficiency in frisking hands and feet, and in donning and removal of protective clothing. The inspectors noted that although BRWT included a lecture on respiratory protection, trainees were not required to demonstrate proper respirator donning or leak-checking techniques, and no hands-on instruction was provided for the respirator prior to the qualifying fit test.

A tour of the GET/BRWT facilities, located in South Haven, Michigan, revealed that considerable effort had gone into upgrading the classrooms and teaching equipment. The inspectors noted, however, that areas presently designated for protective clothing donning and removal were not adequate to meet the stated intention of observing the proficiency of as many as 200 employees in one day.

ALARA aspects of the GET/BWR programs were considered adequate.

b. Advanced Radiation Worker Training

Interviews with Nuclear Training personnel and review of selected lesson plans indicated that non-RSD employees did not, as part of their formal training program, generally receive skill-specific radiological work practices training, other than the general overview given in BRWT. One exception identified was the Advanced Radiation Worker Training (ARWT), given to designated operations department personnel.

The inspectors reviewed the evolution of the licensee's ARWT program to determine the scope, thoroughness, and intended function of the training. Some inconsistencies were noted, as listed below.

The Radiation Safety Plan, Section V, Part 2, "Radiation Work Permits," states that RST coverage or ARWT must be specified on the RWP for such tasks as opening a primary system, working in high radiation areas with levels greater than or equal to 1000 mR/hr, or when the radiological conditions to be encountered are unknown. Administrative Procedure 7.03, "Radiation Work Permit," makes a similar statement in Paragraph 6.4.h, "Unless the workers have received Advanced Radiation Worker Training, Dedicated Radiation Safety Technician coverage shall be specified on the RWP for the following: . . ." followed by a similar, but longer list of tasks, including packaging radwaste.

Although both of the above documents imply that ARWT qualifies a radiation worker for a variety of tasks, Nuclear Training (NT) personnel insisted that the ARWT program, both originally and in its current version was intended solely to allow Auxiliary Operators (AOs) to make self-monitored entries into high radiation areas. NT personnel also stated that the ARWT program had been superseded by the High Radiation Area Access (HRAA) program (part of NT Program 1), and that any procedural references to the ARWT program should be considered out-of-date.

The inspectors noted references to the superseded ARWT program in current revisions of several other licensee policies and procedures, including the course matrix for NT Program 4.3, "Auxiliary Operator Training Program," and HP 2.5, "Entry Control for High Radiation Areas Over 1 R/hr." The inspectors did not identify any licensee procedures, other than NT Program 1, that mentioned the HRAA course.

Comparison of the ARWT course material with the HRAA course material showed that the latter program was considerably reduced in scope, and did not include the ARWT section on "advanced contamination control" or "advanced radioactive material control." The HRAA course was consistent with the current licensee controls stated in Palisades Plant Policy 89-002, "1R Door Verification"; however, RSD Policy 85.021, which governs the qualification of operations

department personnel to perform self-monitoring in high radiation areas, did not reference either the current HRAA program or the current control practices of Policy 89-002.

The inspectors concluded that the lack of procedural clarity, in relation to the current purpose and scope of the ARWT program, left open the potential for misinterpretation and inconsistent radiological control practices. The inspectors further concluded that the absence of skill-specific ALARA training within the formal training programs of non-RSD personnel constituted a missed opportunity for meeting the licensee's safety objective of stimulating plant wide ALARA consciousness.

c. RST Training/HP Continuing Training

The inspectors reviewed NT Program 19, "Radiological Safety and Chemistry Training Program," which outlines the licensee's formal training path for the entry-level RST. Upon completion of GET/BRWT the trainee receives several weeks of OJT, followed by approximately eight weeks at the licensee's Midland training facility. The Midland courses include a generic reactor systems course, HP Fundamentals, and HP-1.

HP Continuing Training, also covered in NT Program 19, is structured to supplement the initial training. RSTs are required each month to attend three 1-hour training sessions, presented in duplicate morning and afternoon classes, with makeups provided for backshift. Examinations accompany each lecture. Documentation of recent HP Continuing Training indicated nearly 100% participation by qualified RSTs.

ALARA aspects of the RST training/HP Continuing Training programs were considered adequate.

d. HP OJT

HP 1.1, "On-the-Job Training," was reviewed for adequacy of the OJT process, procedures, and qualification cards. Several items were found to be out-of-date; for example, the TLD reader practical factors were not applicable to the type of reader currently used by the licensee. In addition, the inspectors noted that the special qualification card for "ALARA/RWP" consisted of only two practical factors, requiring the performance of one pre-job and one post-job review. Interviews with RSD personnel indicated that no additional formal training was given to RSTs designated to write RWPs or perform as ALARA planners. The inspectors did not identify any provisions to ensure that these individuals were trained in other essential areas, such as use and maintenance of job history files, familiarization with the work request/work order routing system, or insertion of ALARA hold points into work procedures.

RSD personnel responsible for the OJT program acknowledged the need for a revision and update of the HP OJT process, procedures, and qualification cards. RSD training personnel stated that this need had already been identified in a review of OJT conducted by an instructional technologist from the licensee's Midland training center. Efforts to complete a substantial revision of the HP OJT process are scheduled for completion by February 1991.

The inspectors concluded that a revision of the HP OJT program, as discussed, was necessary to make the program fully effective. The inspectors also concluded that specific attention should be given towards ensuring that ALARA/RWP practical factors thoroughly prepare RSTs for performing as ALARA planners or RWP preparers.

e. Contractor RST Training

The inspectors' examination of contractor RST training lesson plans found them to consist, in large part, of outdated procedures. Modules 86-03, "Radiological Incident Reports," dated May 5, 1986, was the most recent lesson plan. Module I, "Radiation Safety Department Policies/Practices," dated November 1, 1985, did not reflect the current RST organizational structure or policies. Module X, "High Radiation Area Entry >1R/hr," also dated November 1, 1985, took no advantage of the licensee's experience or lessons learned in this area, nor could it be used to teach incoming contractor RSTs current licensee practices.

A consultant had been hired by the licensee to develop training for contractor RSTs for the upcoming SGRP outage. The consultant stated that extensive revisions to the contractor RST training program were in progress, including complete rewriting of the lesson plans, use of a screening pre-exam to verify basic HP knowledge of incoming RSTs, and job-specific training for the SGRP work. The consultant noted, however, that contractor RST training for the April-May 1990 outage had been somewhat inadequate, due to the need for extensive lesson plan and examination updates. In addition, this training had been conducted in the South Haven training facility, which at that time had no chalk boards, no copying machine, overhead projectors without available overheads, and uncomfortable accommodations. The inspectors' subsequent tour of the facility, described in Section 4.a., above, showed that these unfavorable training conditions had been corrected.

The inspectors concluded that contractor RST training has suffered from a lack of attention and that past failures to maintain lesson plans current and ensure consistency between contractor RSTs and licensee RSTs held the potential for impacting ALARA efforts with inadequate or inconsistent RST job coverage.

f. ALARA Engineering Technology Training

The inspectors reviewed training records and lesson plans for the licensee's ALARA Engineering Technology (AET) training. Currently structured as a 16-hour course, AET includes general ALARA principles, crud activation and deposition, in-place maintenance, plant layout, traffic patterns, shielding design, cost analyses, job planning and control, and ALARA reviews. Available training records indicated that, although AET had been offered several times since 1985, only about 16 Palisades employees had attended (although the attendance list for contractors was somewhat longer).

Several AET attendees told the inspectors that the course was ineffective because it placed too much emphasis on general HP principles, rather than emphasizing design engineering from an ALARA perspective. One system engineer expressed the opinion that the misplaced emphasis was due to AET lesson plans being written by HPs rather than by experienced engineers.

NT personnel acknowledged these observations, noting that several extensive AET revisions had already been conducted, and that continuing efforts were in progress to make the course both attractive and effective for technical and engineering attendees. The roster for the upcoming June 27-28, 1990, AET course listed 10 prospective attendees, with a notable cross-section of personnel from the operations, maintenance, and engineering groups.

The inspectors concluded that the licensee's ongoing efforts seem well-directed toward establishing an adequate AET training program.

g. Specialized Training for ALARA Personnel

The inspectors reviewed RSD participation in professional workshops and seminars related to ALARA. The HP superintendent and the corporate ALARA design engineer had attended the 1989 Brookhaven National Laboratory ALARA Conference; the corporate ALARA design engineer had also attended the 1989 EPRI workshop.

Both the ALARA Coordinator and the ALARA Operations Supervisor regularly attend the Westinghouse REM seminar. The ALARA Coordinator had also attended the 1989 INPO RPM workshop, the 1989 Region III ALARA coordinator meeting, and various certification training courses.

The ALARA Coordinator stated that several of these workshops and seminars had proved helpful. As an example, the purchase and use of a surrogate tour system (see Section 9) as an ALARA tool had been prompted by a Region III ALARA coordinator meeting.

h. Use of Mockup Training

Interviews with the SGRP ALARA planner revealed plans for the use of four major mockups as an ALARA tool for the upcoming SGRP outage. None of the four mockups was available for observation in a ready-to-use condition; however, the licensee seemed confident that each would be completed in time for adequate mockup training. The SGRP ALARA planner stated that mockup training would include all crew leaders and lead technicians, all applicable crafts, and as many RP personnel as possible. In addition, intended simulation of plant conditions will include appropriate lighting, confined spaces, signs, boundaries, protective clothing, respirators, multibadging, pre-job briefings, and RWP sign-ins.

Although construction of these mockups appeared to be somewhat behind schedule, the inspectors concluded that the intended scope and thoroughness of mockup training for the SGRP outage, as planned, appeared to appropriately address ALARA objectives.

i. Training Feedback Initiatives

The inspectors evaluated the licensee's mechanisms for providing feedback to the training department on strengths and weaknesses observed by the operations, maintenance, and radiation protection groups. The Training Review Tracking Committee (TRTC) is one such mechanism, a review board made up of NT instructors and supervisors from each program, as well as departmental training representatives. The TRTC reviews Radiological Incident Reports, plant modifications, Deviation Reports, Event Reports, vendor correspondence, procedural changes, and industry bulletins; those reviews are incorporated into lesson plans.

While the TRTC appeared to serve a valuable function, interviews with several NT personnel and departmental training coordinators indicated that the TRTC was seldom used by operations, maintenance, or radiation protection personnel as a vehicle for providing feedback on ALARA training deficiencies observed during work performance. The inspectors noted that in some instances where specific training deficiencies were identified by a Corrective Action Review Board, training had been conducted for an entire department to promptly correct the problem.

Another training feedback mechanism related to ALARA was initiated by a March 20, 1990 memorandum from the Radiological Services Manager, specifically requesting input toward reformatting lesson plans for contractor RSTs. The inspectors reviewed the file of responses to the memorandum; requests included such items as increasing surrogate tour awareness, clarifying the policy on hot spots, and clarifying the 1 R/hr high radiation area control policy.

The inspectors concluded that more attention should be given toward routing ALARA training suggestions through the TRTC, and toward soliciting such suggestions from operations, maintenance, and radiation safety personnel; however, the training feedback initiated by the memorandum described in the preceding paragraph appeared to be a commendable effort.

j. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA program.

Improvement Items:

- The scope and intended function of the Advanced Radiation Worker Training/High Radiation Area Access training should be clearly defined. The lack of procedural clarity, and the inattention to updating applicable procedures, has left open the potential for misinterpretation and inconsistent radiological control practices.

- ALARA concepts should be more thoroughly incorporated into standard Nuclear Training programs for non-RSD personnel.

- The RST OJT program should be revised and updated; specifically, the amount of OJT given to ALARA planners and RWP writers could be improved.

- To improve contractor RST training revise out-of-date lesson plans, provide a screening pre-exam and improve training facilities.

- Revise Administrative Procedure 7.02, "Radiation Work Permits," to clarify the purpose of Advanced Radiation Worker Training. Revise the Radiation Safety Plan, RSD Policy 85.021, and NT Program 4.3 to clarify the current status of this training program.

- Evaluate the usefulness of incorporating ALARA concepts and techniques into applicable NT programs for non-RSD personnel.

- Revise and update the RST OJT program. Specifically, expand the qualification card for ALARA/RWP.

- Ensure that revisions of contractor RST training lesson plans are completed before SGRP outage training begins. Review these lesson plans to ensure that consistent radiological work practices will be implemented by contractor and licensee RSTs.

6. Management Goals

ALARA goal-setting at Palisades was evaluated during reviews of applicable documentation and interviews with plant personnel. Areas examined included methods of estimating dose, accuracy of dose projections, and management involvement. Because the licensee treats SGRP as a separate project, with its own exposure estimates and summaries, SGRP goal-setting is discussed separately.

a. Dose Estimation

The licensee does not have a procedure governing annual collective radiation exposure goal-setting; however, internal memoranda circulated by the ALARA Coordinator at the onset of each year describe the methods of arriving at dose projections and the basis of establishing dose goals. Comparing these memoranda for the past three years revealed a consistent but steadily refined method of setting goals.

1990 was the first instance of significant involvement by department superintendents in ALARA goal-setting. Beginning in October 1989 the ALARA Coordinator compiled a crude estimate of 1990 dose based on the projected scope of 1990 work, number of days of projected scope of 1990 work, number of days of projected outage time, and historical rates of dose accumulation during outage and operational periods. This information, along with 1988 and 1989 exposure data for specific tasks and other relevant historical information was passed on to department superintendents. The superintendents then set initial goals for the year, broken down by specific task and work group. The ALARA Coordinator worked with each superintendent to refine these initial goals, suggest methods of dose reduction, and compare the goal breakdowns to the 1990 project list. The compiled summary of refined exposure goals was then presented to the Radiological Services Manager, and brought before the ALARA Committee for review. The ALARA Committee, consisting of the plant manager and all assistant plant managers, the HP Superintendent, the Chemistry Superintendent, the Engineering and Construction Manager, and the ALARA Coordinator reviewed the projected dose goals systematically, made suggestions and revisions, and gave final approval. The final number for Palisades' overall 1990 collective dose goal, set at 500 person-rem (excluding SGRP activities), was chosen by the plant manager.

The inspectors noted several improvements to the 1990 goal-setting methods over previous years. First, 1990 was the first year to involve department superintendents in setting their own goals. Since the achievement of ALARA goals and objectives is an element in job performance appraisal for employees at the superintendent level and above, this involvement at the goal-setting stage was an apparent effort to define one area of ALARA responsibility and heighten ALARA awareness.

The second apparent improvement to 1990 goal-setting was prompted by the ALARA Committee, and involved the establishment of dual goals as a measurement of dose reduction success. The 1990 goals listed in the ALARA Coordinator's internal memorandum were considered "fully effective" levels of performance; a more stringent set of goals, generally set several percent lower, was passed on to superintendents as a standard of "exceptional" dose reduction success, to provide additional incentive.

In an effort to make the 1990 goals challenging, the estimate of dose accumulation during plant operation used an average accumulation rate from the three best months of 1989, of 185 mrem/day. Specific projects and major recurrent outage task goals were also set by matching the best doses for those jobs from previous years.

The inspectors concluded that dose estimation techniques used in the setting of annual collective exposure goals were adequate in meeting ALARA objectives. Involvement of department superintendents in goal-setting was viewed as a marked improvement and the use of "exceptional" dose target levels was viewed as an innovative method of providing ALARA incentives.

b. Effectiveness in Tracking and Meeting Goals

The licensee uses several methods for tracking actual dose received in relation to projected dose goals. Frequently updated trend graphs are used to plot actual exposure received against the curve of projected dose accumulation; these graphs are maintained for plant-wide exposure, for individual groups such as maintenance/ engineering or administrative services, and for specific departments such as electrical or mechanical maintenance. The graphs are circulated to department superintendents, and are conspicuously posted for general viewing at the entrance to access control. Detailed shorter-term graphs are also maintained during outage periods. In addition, periodic reports are circulated which track active RWP accumulated dose versus projected dose.

In 1988, the projected goal of 550 person-rem was exceeded by about 34 per cent. A large portion of the underestimation (about 113 person-rem) was due to unplanned steam generator work; in addition, the refueling outage in 1988 lasted over 100 days, rather than the original estimate of 75 days, and several projects were added to the year's work scope after goals were established. The breakdown of projected versus actual dose by department indicated that only 6 out of 12 departments came within ± 25% of their original annual goal.

In 1989, the original plant goal of 300 person-rem was revised to 400 person-rem when it became clear early in the year that extensive steam generator repairs would take place. Actual exposures; however, were much less than expected; the overall plant dose for 1989, by TLD, was 294 person-rem. No department exceeded its goal; out of 18 departments listed, only 7 were within 25% of their annual goal, and 4 received less than 50% of the dose originally projected.

The inspectors concluded that the licensee's mechanisms for tracking actual versus projected doses were adequate. In relation to the effectiveness of meeting goals, a marked improvement was noted in 1989 over previous years; however, the fact that actual dose was significantly lower than the annual goal for most departments indicated that 1989 goals might have been more challenging.

c. Steam Generator Replacement Project (SGRP)

The SGRP group established its own annual dose goal of 699 person-rem, to be tracked separately from the plant annual collective dose goal of 500 person-rem. This separation was partially intended to serve as an ALARA initiative to the vendor, with substantial monetary incentives offered by the licensee for every person-rem under goal which the vendor achieves.

Goals for the SGRP were broken down by task and, where possible, by individual RWP. The vendor's estimates of man-hours and task breakdown were used in conjunction with job histories from industry experience in steam generator replacement and related tasks. These time estimates were merged with the licensee's data on high, general, and low dose rates in the work area for each task, and weighting factors were assigned based on estimates of which specific locations would be occupied for the majority of the time spent on the task. A construction dilution faction was also applied to account for time spent dressing out, walking to and from the job site, and so forth.

The ALARA planner for the SGRP submitted the final estimate of projected dose to the SGRP Project Radiation Protection Manager, who in turn presented the SGRP dose goals to the ALARA Committee. At the time of the inspectors' appraisal, final bargaining was still to take place between licensee and vendor as to the agreed-upon goals and associated financial incentives.

The inspectors concluded that the methods used to set SGRP ALARA goals were adequate.

d. Management Involvement

Management participation in actual dose goal-setting was most evident in the ALARA Committee. All plant managers are members of the ALARA Committee, and the ALARA Committee conducts the final review of annual collective dose goals. This arrangement serves the dual function of adding management insight to the goal-setting process and maintaining management awareness of ALARA considerations.

In an effort to determine management support and direction of ALARA initiatives and goals, the inspectors interviewed several members of the Scope Control Team (SCT). The SCT is the controlling board for implementation of the licensee's Five-Year Plan. The SCT consists primarily of the Plant Manager and his department managers. The SCT reviews projects proposed by program managers throughout the plant, to establish priority and assess scope, to determine the appropriate degree of focus on the specific issue, and to permit all managers to have input.

In all cases, the SCT members interviewed were knowledgeable of recent ALARA initiatives, and management support of the ALARA program, in general, appeared highly adequate. However, the management involvement appeared to be more reactive than directive; that is, in order for ALARA considerations to be implemented, individual initiatives needed to be taken at the superintendent level and subsequently presented to the SCT, as opposed to a specifically directed ALARA improvement plan being directed from the level of higher management. When asked to identify the direction that future ALARA initiatives should take, each SCT member interviewed had a different answer: one stated that ALARA concepts had to be ingrained into the minds of individual workers, another stated that hot spots and general area radiation levels had to be reduced, another said that continued attention had to be focused on minimizing personnel contaminations, and so forth.

The inspectors noted that the lack of an overall management-directed ALARA improvement plan may also have been a reason for observed disparity between different licensee groups in awareness of ALARA goals and objectives. This disparity was evident in interviews with various licensee first-line supervisors and planners. While some groups (such as the refueling project personnel) seemed to have a high level of ALARA awareness and a high degree of participation in establishing and implementing ALARA objectives, other groups (such as mechanical maintenance planning) seemed to regard the implementation of ALARA concepts and goals as the function of the Radiological Services Department.

The inspectors concluded that, while management involvement in setting annual collective dose goals and management support of most ALARA initiatives appeared adequate, additional consideration should be given to establishing overall management-directed ALARA objectives.

e. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA Program.

Strength: Involving superintendents in setting annual dose goals for 1990 was an improvement over previous years, and the establishment of additional "exceptional" target levels appeared to be effective in providing additional incentive for ALARA initiatives.

Improvement Items:

- Develop an overall management-directed ALARA improvement plan to improve the level of ALARA awareness and involvement in ALARA initiatives among various licensee groups.
- Establish a standard procedure for setting annual collective dose goals, to ensure that the present goal-setting techniques are not overly dependent on the presence of the current ALARA coordinator.
- Develop and implement a management-directed ALARA improvement plan.

7. ALARA/RWP Procedure Implementation

a. ALARA/RWP Procedures

The licensee uses a radiation work permit (RWP) system to evaluate the radiological conditions and to specify the radiological control requirements to be implemented for radiological work. Administrative Procedure No. 7.03, "Radiation Work Permit," defines the purpose of RWPs and establishes criteria for RWP preparation and approval. There are two types of RWPs: General, which is used for routine repetitive access to work in radiologically controlled areas (RCAs); and Standard, which is required for specific jobs and where significant dose, contamination, or airborne activity may be involved. Standard RWPs are valid for the duration of the job and if required by the RWP, periodically reviewed during the job. The procedure specifies a 72-hour lead time for submittal of RWPs for ALARA review, which in most cases, according to the licensee, is sufficient time to perform the review.

The policies, goals and standards to reduce personnel radiation exposure are specified by licensee Procedure No. 7.02 "ALARA Program". It establishes criteria for ALARA reviews based on radiological conditions and defines responsibilities for management and workers. It also addresses such matters as time requirements for RWP submittal, sets the criteria for pre and post-job ALARA reviews, use of job history files, cost-benefit analyses and dose tracking. One of the criteria for initiation of an ALARA review is when a specific job is expected to exceed 3 person-rem. The inspectors informed the licensee the industry norm is 1 person-rem which affords closer scrutiny of dose producing jobs. The procedure includes a pre and post-job checklist and provides guidance for pre and post-job briefings and use of the pre and post-job checklist. The inspectors noted that the procedure has not been updated to

reflect the current organization of RSD. Specifically, some positions now exist (ALARA Coordinator and ALARA Operational Supervisor) for which responsibilities are not clearly delineated. The procedure also specifies the word "should" instead of "shall" in many sections which weakens the procedure and conveys an impression of weak management support for ALARA. For instance, the procedure specifies that the ALARA Coordinator should perform a documented review of any operations, procedures or designs where specific criteria exist, that a formal briefing should be conducted before the job if it meets certain criteria, that review findings should be recorded and made part of the Job History File, and, that the Job History Files should be maintained and should include certain material that may aid in future jobs. Problems identified elsewhere in this section regarding incomplete historical files and poor ALARA reviews are partially the result of the loosely defined requirements in the procedure. The inspectors concluded that the weak procedural criteria are not indicative of strong management support which would be a necessary prerequisite to the implementation of an effective proactive ALARA program.

The licensee's administrative procedures describe the preparation, revision, and review of station procedures. However, they do not require or provide for review of other department procedures from an ALARA standpoint. This contributed to the impression that ALARA is primarily the responsibility of the RSD RP/ALARA staff rather than of the entire station. The ALARA staff does, however, review special procedures written to cover certain work activities that have significant radiological concerns.

In addition to the loosely defined requirements of the ALARA procedure, the inspectors noted the procedure does not stress fundamental dose reduction techniques such as ensuring that only essential personnel and appropriate equipment be used, nor does it address the need for other departments to maintain lessons learned and good historical information from previous jobs for use during the work order and planning process. Without sufficient historical information, including lessons learned, the potential exists that unnecessary personal radiation exposures may not be precluded. During one recent example (April 1990) involving repair of HPSI check valves, the actual dose for the job was about 20 person-rem greater than the projected dose of 10 person-rem. Owing to problems caused by the welding process used, the work time was much longer than anticipated. During the post-job review of this job it was discovered that similar problems associated with the welding process occurred during performance of the same work in 1983 and 1986, but that information had not been kept in the maintenance history files. The availability of that information could have prevented or reduced the exposure during the most recent work evolution.

b. ALARA Input into Job Planning

There is no formal policy/mechanism to ensure that ALARA personnal are involved in the work order/package review process. However, a

pilot program established in 1989 between the ALARA group and mechanical maintenance allows the ALARA group to routinely review all work orders for the mechanical maintenance department. They can add steps or establish hold points; however, mechanical maintenance can bypass these points at their discretion (See Section 8). ALARA personnel also participate in outage planning, systems and station modification meetings which affords the ALARA operational group advance knowledge of upcoming work. This group performs all surveys for the ALARA review and prepares all RWPs; work activities are reviewed on a sub-task basis.

The inspectors reviewed the adequacy of the licensee's person-hour and person-rem estimations for completed RWPs for recent outages. Estimated person-hours for tasks are provided by the work analyst for the total job. The ALARA operational group evaluates the estimate based on previous history if available and may change the estimate if it appears inordinately high or low; however, it is generally accepted. During a review of a printout containing about 90 RWPs initiated in 1988, 1989, through April 1990, which required pre and post-job ALARA reviews, the inspectors noted that most jobs exceeded the estimated person-hour and person-rem projections; many by greater than 50%. In most cases the greater than expected doses were the result of underestimated person-hours because of inadequate data in the job planner historical files. It was also noted that there were about 35 RWPs written for jobs that actually exceeded three person-rem that had not received an ALARA review because the estimated doses were less than 3 person-rem. Some of RWPs were designated as General RWPs, which do not require ALARA reviews, and some standard RWPs were not reviewed at the discretion of the ALARA Coordinator because of the nature and duration of the jobs. However, several of the reviews were not performed only because inappropriately low person-hour estimates partially caused the projected doses for the jobs to be below the 3 person-rem action level for ALARA reviews. For example, the actual time to replace damaged hangars in the containment was about 3 times the projected time and the dose was about 2 times that estimated. Similarly, the actual time for labor support for removing/replacing insulation for ISI work was about 7 times the projected time and the actual dose was about 4 times that estimated.

Inspectors also noted that during the 1988 and 1989 outages there were considerable doses for HP surveillance and survey activities in the containment performed under Standard RWPs. Specifically, 2.5 projected versus 35 actual person-rem and 0.8 projected versus 14 actual person-rem for 1988 and 1989, respectively; thus neither of these task activities required ALARA reviews. Although some of the dose can be attributed to the RWP work activities under which the RSTs were working, much of this dose was actually received while RSTs were performing HP activities for work being performed under other Standard RWPs in containment, according to licensee representatives. Thus, the RSTs inappropriately utilized the

containment surveillance/survey RWPs. According to the licensee, personal dose should be attributed to the actual RWP under which the work is performed. Better dose accounting on Standard RWPs should be required to ensure proper planning is accomplished for future similar jobs, and for proper tracking and evaluation of RST daily exposures. This matter is considered a programmatic weakness because it occurred during at least two consecutive outages and the licensee was unable to ascertain dose accumulation to HP personnel performing specific tasks in containment.

Some of the significant discrepancies between proposed and actual person-hours and person-rem are the result of changing job scope due to unforeseen problems, poor work practices, and lack of proper equipment. However, based on discussions with licensee personnel and a review of certain job history files, it appears the job planners do not have sufficient historical data and the information which is available is not used effectively as evidenced by the HPSI check valve job discussed in Part a of this section. One of the most significant effects of underestimating person-hour and person-rem projections is the failure to perform ALARA pre and post-job reviews.

The inspectors also discussed with members of the RSD RP/ALARA supervision/management staff several large work evolutions (tasks) whose dose projections were specified by numerous RWPs (sub-tasks), nearly all of which were estimated to be less than 3 person-rem (even though the total for each work evolution was projected to be many times the 3 person-rem criterion for ALARA reviews). The licensee representatives contacted agreed that task ALARA review criteria should be developed to supplement the sub-task (RWP) person-rem projection criterion to increase the ALARA scrutiny of large work evolutions.

c. Procedure Implementation

The inspectors review of the ALARA controls outlined in the RWP and ALARA procedures indicated these implementing procedures address the essential elements of an ALARA program for performing pre and post-job ALARA reviews and controls for radiological work activities. However, the following concerns were identified:

- Although the ALARA procedure indicates that maintenance and modification planning staffs should incorporate exposure reduction methods into work packages and radiological considerations should be incorporated during the job planning process, based on the review of several work packages and discussions with personnel, there does not appear to be a significant effort by other than RSD RP/ALARA personnel to

incorporate exposure reduction efforts into the job planning process. Although the RSD RP/ALARA staff is proactive and conscientious, their efforts could be much more effective if they were more thoroughly involved the planning process and if planners were generally more aggressive in implementing ALARA principles as an integral part of the job planning process.

- The ALARA procedure states that job history files should be maintained by the ALARA Coordinator as the primary source for future planning, and they should include the planning package, exposure estimates, actual exposures, post-job reviews, drawings, photographs and lessons learned. The inspectors found that although the files are maintained in the ALARA group, many are incomplete and do not contain the specified information.

d. ALARA Job Reviews

The RWP and ALARA program procedures specify the methods to be used to perform ongoing job reviews of radiological work activities, track doses, and perform pre and post-job reviews. Documentation reviews and discussions with licensee personnel indicated that in the past two years almost all formal ALARA pre and post-job reviews required were performed. Based on the quality of post-job reviews for certain jobs such as the removal and replacement of PORVs and piping, the S/G inspection and repair job, and the HPSI check valve job, it appeared that the quality of post-job ALARA reviews was good.

e. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA program.

Strengths:

- The quality of post-job ALARA reviews appeared good
- The RSD RP/ALARA staff is proactive and conscientious in incorporating ALARA principles into the job planning process.

Improvement Items:

- The ALARA procedure should be revised to provide more stringent criteria for ALARA review activities.
- ALARA job history files and job planner files should be upgraded to include additional relevant historical information.
- Improve person-rem and dose estimations to preclude further failures to conduct needed pre and post-job ALARA reviews.

- Develop a formal mechanism to ensure adequate ALARA involvement in work package preparation and pre-job planning activities.

- Implement corrective actions to ensure that RST dose is attributed to the proper RWP under which it was accumulated.

- Consider establishing a task limit even if individual RWPs associated with that task are all below the 3 person-rem criterion for ALARA reviews.

- Consideration should be given to lowering the 3 person-rem criterion for ALARA reviews.

8. Planning/Scheduling

The inspectors reviewed the adequacy of the work planning and scheduling process for allowing sufficient lead time to incorporate ALARA concerns.

a. Long-term Planning

Long-term planning is contained within the licensee's Five-Year Plan. The Plan is reviewed quarterly by the SCT (see Section 6), and is revised accordingly. Annually, the Plan may again be revised when the station's budget is determined. The ALARA Coordinator is responsible for the ALARA section in the Plan, consisting of mainly large-capital, dose saving or source reduction initiatives. Large capital jobs in other departments are also included in the Five-Year Plan. The inspectors' review indicated that the licensee's long-term planning process provides adequate notification to the ALARA group of future, large dose jobs, and adequate direction for implementation of large-capital, dose saving or source reduction initiatives.

b. Short-term Planning

Short-term planning is accomplished with the station's running 72-hour and four-week schedules, and outage schedules. The station's Operations Scheduling Coordinator and the planning group develop these schedules and meet daily with representatives of the work groups and the station RWP/ALARA and operations health physics groups to review the established 72-hour and four-week schedules. Problems with meeting the schedules or providing support to the lead work groups are discussed at these meetings. The 72-hour schedule is updated daily, whereas the four-week schedule is updated weekly. An outage emergent work schedule is also maintained and updated several times each week. The Operations Scheduling Coordinator meets with work group planners prior to work scheduling to review work orders and assign them to outage schedule "windows" or time slots. Non-outage work requests are also reviewed prior to scheduling to ensure efficient use of Operations Department personnel for any equipment tagouts and surveillances required because of the planned work.

For outage work, the RWP/ALARA group stated that there is sufficient lead-time for writing RWPs and conducting ALARA reviews because several weeks before work items are listed in the 72-hour schedule they informally meet with work planners to discuss jobs. In addition, for several recent outages persons from the RWP/ALARA group have been detailed to certain work groups (i.e., the station construction group, to a group established to reinspect safety related pipe hangers, and to the SGRP) to review work orders early in the development phase and to initiate RWPs and ALARA reviews. According to the licensee, these details have improved the quality and timeliness of RWP preparation and ALARA reviews.

For non-outage work, however, ALARA personnel stated to the inspectors that they commonly do not have knowledge of jobs until they are listed on the 72-hour schedule. They stated that in most cases, this notice was adequate to prepare an RWP and conduct an ALARA review, if necessary; however, for some jobs, the notice was barely sufficient, or was insufficient, because the jobs were complex and adequate reviews could not be done in the time allotted or the work plan did not take into account certain radiological conditions, resulting in a need for a revision of the work order. Licensee representatives stated that for several work orders, the disparity between the work plan and the jobsite radiological conditions indicated that the planners had not walked down the jobsite prior to the planning. Several efforts taken to allow RWP/ALARA personnel to review work orders earlier in the development/ scheduling process have not been fully successful. Recently, an RWP/ALARA staff person had been assigned to review non-outage mechanical maintenance department work orders, but the assignment was terminated earlier than planned because of other demands on the staff person's time. And a recent change to the computerized work order preparation mode of the AMMS (Advanced Maintenance Management System) that allowed for online approval of work orders by the RWP/ALARA group has been routinely circumvented according to several mechanical maintenance planners. This circumvention essentially short-circuiting any potential early ALARA involvement in the work order preparation. Most of the mechanical maintenance planners interviewed by the inspectors stated that the ALARA aspect of planning was RSD's responsibility and not theirs. They also stated that the responsibility for initiation of RWPs between mechanical maintenance and RSD had changed several times recently by verbal directive and they were confused regarding the current status because of these changes.

Additional effort by the licensee to ensure that the RWP/ALARA staff has sufficient time to review non-outage work packages appears necessary. This effort could take the form of a revision to Administrative Procedure No. 5.01, "Processing Work Requests/Work Orders," to include a requirement that work planners notify the RWP/ALARA group as soon as possible of a need for an RWP (currently only a 72-hour lead-time is required), establishment of an RWP/ALARA group liaison in the major work groups for non-outage work activities

(with relief provided from other job activities), improved communications between the RWP/ALARA group and the Operations Scheduling Coordinator, and/or revision of the work order process to require RSD review of work packages before approval.

The inspectors also reviewed the adequacy of the work planning and scheduling process for the SGRP. Although there has been a delay in establishing an approved radiation protection plan and an interface document between the SGRP radiation protection group and RSD (Section 3), the planning and scheduling process for the SGRP appeared adequate.

The inspectors also reviewed the adequacy of the RWP/ALARA planning and implementation for a safety-related hanger inspection project. The project was managed by the station's former ALARA Coordinator. The review indicated that RWP/ALARA planning and implementation for project was good. Project members and SGRP personnel stated that they made extensive use of the surrogate tour system (see Section 8) in their planning.

c. Temporary Shielding

An additional area related to ALARA planning that needs improvement is timeliness of engineering evaluations for temporary shielding installation requests. A review of shielding evaluations and discussions with licensee representatives indicated that although engineering analyses were usually promptly performed for job specific shielding requests (the analyses were completed in one day to several weeks), several analyses not involving shielding for specific jobs, such as shielding pipes in walkways or general access areas, had not been done promptly. For example, shielding evaluation request #70 was submitted on May 26, 1989, and had not been completed by the engineering staff by November 1989 when it was cancelled; shielding evaluation request #71 was submitted on August 22, 1989, and was not completed until February 1990; and shielding evaluation request #72 was also submitted on August 22, 1989, but had not been completed by the end of the inspection.

d. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA program.

Strengths:

- Use of the Five-Year Plan for planning long-term, large-capital ALARA initiatives.

- Assignment of some RWP/ALARA personnel to various project work groups to expedite RWP preparation and ALARA reviews.

Improvement Items:

- Improve short-term planning for non-outage work (including planners walking down jobsites prior to writing job plans, ensuring RWP/ALARA group is aware of jobs before the 72-hour schedule is distributed, and stopping the routine circumvention of the RSD ALARA review provision of AMMS).

- Improve the timeliness of engineering analyses for non-job specific shielding requests.

- Assign ALARA personnel to maintenance department and improve communications between the RWP/ALARA group and the Operations Scheduling Coordinator.

- Develop a formalized mechanism to assure early ALARA involvement in the development of work packages and that work planners are knowledgeable of appropriate ALARA job history file information.

- Aggressively pursue a management-directed initiative to correct the cultural attitude of some plant personnel (including members of the planning staff) that RP/ALARA activities and concerns are solely the responsibility of RSD.

- Develop a formalized mechanism to establish the responsibility for maintenance RWP initiations.

9. ALARA Initiative/Operational Practices

The inspectors reviewed records, data and discussed with licensee personnel the following dose reduction initiatives/operational practices.

a. Industry-Identified Dose Reduction Techniques

With the exception of source term reduction programs, licensee personnel indicated that Regulatory Guides and NUREG documents were not routinely reviewed to identify dose reduction techniques. However, Generic Letters and Licensee Event Reports that involved radiation protection and ALARA issues were routed to the assigned ALARA group for review for applicability and impact. The Nuclear Network system has been queried by the licensee to obtain information regarding hot spot reduction programs and entries into the containment during power operations.

The licensee is currently involved in the Combustion Engineering Owner's Group. The licensee indicated that it was participating in three EPRI/CE Owner's Group source reduction studies: Generic Guide for Cobalt Reduction, Chemical Decontamination of Primary Coolant System and Zinc Injection. The licensee indicated that funds have been appropriated to support these studies.

b. Implementation of ALARA Techniques

(1) Source Term Reduction

The licensee is making progress in reducing the incore and excore inventory of high cobalt-bearing materials as evidenced by the licensee plans to replace 30-40 high-cobalt valves during the SGRP outage and to replace in the next 3-5 years the current fuel assemblies (containing high-cobalt Inconel support grids) with assemblies which have low-cobalt Zircaloy support grids. However, this effort is characterized more by individual initiatives than by a comprehensive plant initiative. For example, valve replacements in primary systems are not routinely reviewed for cobalt reduction, although the the Pump and Valve Program Section does provide consultation to system engineers regarding cobalt reduction and valve specifications upon request. Currently, no formal program or direction exists to assure that cobalt reduction efforts will continue. There has been no general evaluation of plant systems and components for cobalt content. Nor have action plans been adopted with defined priorities to reduce the inventory of high-cobalt components within plant systems.

The licensee initiated hydrogen peroxide additions to the primary coolant system (PCS) during the 1989 and 1990 maintenance outages. This induced a controlled crud burst that was subsequently cleaned by the purification system. This cleanup resulted in removal from the PCS of significant quantities of cobalt-58, cobalt-60, dose equivalent iodine-131 and elemental nickel, and in reduction of some primary system components radiation levels. The licensee plans to continue these hydrogen peroxide additions prior to future refueling and maintenance outages.

The licensee indicated that the Electric Power Research Institute (EPRI) method of coordinated lithium-boron pH control has been adopted. This is expected to reduce crud bursts during plant operations and thereby minimize the activation of corrosion products in the PCS.

The licensee has performed several evaluations of the character of suspended activation products in the PCS. These studies indicated that most of the suspended activation products were in the 0.22 to 0.45 micron range. The licensee has begun a program to gradually down-size filters. Since one micron nominal and

six micron absolute filters were effectively about the same size, the one micron nominal filters were initially replaced with six micron absolute filters. Reportedly, the licensee plans to replace the six micron absolute filters with one micron absolute filters. Based upon filter changeout performance, the licensee expects to further reduce filter porosity.

The licensee has adopted a program to identify, track and reduce the number of hot spots in the plant. Hot spots are given a unique number and are tracked on a database. Each month, the assigned ALARA group prepares a report that prioritizes the hot spots for removal. This report is submitted to operations, radiation protection, maintenance, and construction groups for flushing, shielding and cutout/replacement, as appropriate. This report is also submitted to the Plant Manager. This program has resulted in significant dose savings. Although little attention/support appeared to be given to hot spot reduction during the recent maintenance outages, this program offers significant opportunities to further reduce exposure and to implement improved technology.

(2) Decontamination Techniques

Hydrolazing has been used extensively to perform reactor cavity decontamination, cleaning of tanks and flushing of drain lines. Steam cleaning has been used for area decontamination and tank cleaning.

Strippable coatings have been used for area decontamination, including high dose rate areas and unpainted concrete. Material compatibility studies have been completed for use of strippable coatings in the reactor cavity. The licensee indicated that these studies have concluded that reactor cavity decontamination by strippable coatings is acceptable. However, because of the extended application time, the licensee indicated that strippable coatings would not be used during the SGRP/Refueling Outage.

The licensee utilizes an electrosonic sink and manual scrubbing for tool and equipment decontamination. The freon unit used for tool decontamination is being decommissioned to obviate dealing with mixed waste issues. Other methods of decontamination are available and are utilized by other licensees.

Upon removal of the steam generators during the SGRP outage, the licensee plans to use grit blasting followed by glass bead blasting to decontaminate the pipe ends. This is to be performed in a closed environment, utilizing a modified glove bag technique.

The licensee indicated that decontamination workers brought in for the outage were screened for experience. Reportedly, emphasis was placed on obtaining previously Palisades site-experienced workers.

(3) Video and Communication Equipment

Video and communication equipment have been used for steam generator maintenance. This includes remote observation and control of eddy current testing. Communication equipment has been used with steam generator jumpers, testing personnel, and health physics to coordinate steam generator maintenance activities such as test, video, and tube-plugging equipment setup and dismantling.

The SGRP project has budgeted funds for 12 video cameras and two monitoring stations. One station is to be placed near the work site in containment and the other will be located at the containment access facility. These monitoring stations are to be used for health physics job monitoring, project supervision and worker awareness.

Funds have been budgeted to purchase an upgraded radio system that comprises a repeater station, several antennas and radio headsets. This will facilitate communications among radiation protection personnel and timely dissemination of radiological condition information.

The cameras, monitoring stations, and communication equipment have the potential of significantly reducing radiation exposure. Licensee personnel indicated that these would be used during the SGRP.

(4) Sump Cleaning

Licensee representatives indicated that containment sumps were manually cleaned. This involved manual removal of muck and accumulated debris. The licensee indicated that the use of hydrolazing and/or high powered pumps for sump cleaning had not been considered. The manual method results in increased time in the radiation area and closer contact with radioactive materials.

(5) Refueling/Reactor Head Maintenance Activities

Licensee performance on refueling and reactor head maintenance appears to be very good. In addition, the supportive working relationship between the ALARA and Refuel Engineering staffs has shown strong positive results in dose reduction and outage time savings. From 1983 to 1988, from reactor head removal to reactor head re-installation, time spent has been reduced from 28 days to 16 days and person-rem expended has been reduced from 161.8 person-rem to 71.2 person-rem.

(6) Steam Generator Maintenance

Licensee representatives indicated that the block and tackle method of removing steam generator manways was still being used. The inspectors were informed that this was due to the small amount of clearance between the steam generator (S/G) manways and the S/G platforms. During the SGRP planned for the fall of 1990, the licensee intends to lower the S/G platforms by 18 inches to facilitate the use of hydraulic lift rigs for S/G manway removal and reinstallation. If the licensee had completed this modification earlier, significant dose savings could have been realized.

The licensee indicated that the use of S/G nozzle dams was implemented in 1986. Redundant nozzle dams and improved designs were implemented during the refueling outage of 1987. The use of this technology facilitates S/G work during refueling operations and provides some shielding from radiation sources in cold and hot leg piping. This technology has been available since 1980. Significant outage time savings and dose savings could have been realized if implementation had occurred earlier.

The licensee indicated that S/G manway shields were acquired in 1987. These shields are constructed of an inch to an inch and a half of lead and are bolted directly onto the S/G manway. Each of these shields are designed with ventilation connections and can be locked to prevent unauthorized personnel access. New S/G manway shields will be used on the replacement S/Gs.

The licensee indicated that dedicated health physics coverage for steam generator maintenance began during the 1987 maintenance outage. Maintaining radiation exposure ALARA usually requires the utilization of experienced, job dedicated personnel. The use of dedicated health physics technicians for S/G maintenance has been an accepted industry practice since the 1970's. If this practice had been implemented at Palisades sooner, significant dose savings could have been realized.

(7) Steam Generator Replacement Project (SGRP)

During June 1989, licensee personnel traveled to the Indian Point #3 nuclear plant to gather information and lessons learned from the completing Indian Point #3 SGRP. In addition, a memo dated April 27, 1990, was issued to various Palisades SGRP project managers. This memo included an attached SGRP Lessons Learned list that catalogued and assigned action items to responsible organizations and individuals. These lessons learned were identified from five previous SGRPs: D.C. Cook,

Indian Point #3, Surry, Point Beach and H. B. Robinson. If lessons learned are factored into SGRP planning and are properly implemented, significant outage time and dose savings could be achieved.

The licensee prepared a sixteen page bid specification for the radiation protection and ALARA portions of the SGRP. This specification required the contractor to include time for decontamination and ALARA activities in proposed schedules and bids. In addition, the licensee and the SGRP contractor have agreed to an incentive program. This program provides bonuses for achieving dose reduction targets and financial penalties for failure to meet dose reduction targets.

The new S/Gs that will be installed during the upcoming SGRP include a number of design changes that should improve both operational performance and reduce radiation exposure. In addition, the licensee plans to pretreat the surface of the S/G channel heads. The pretreatment process will consist of mechanically cleaning and smoothing the surface. Brushing will be utilized to remove scale and debris. This will be followed by flapping and buffing to enhance surface smoothness. Finally, the S/G channel heads will be electropolished. The channel heads will then be rinsed with demineralized water to remove all residues. The licensee expects surface smoothness to be featureless at a 100X scanning electron microscope. This process is expected to minimize the corrosion layer in the S/G channel heads; and, therefore, reduce the deposition of activated corrosion products. This is expected to produce significant dose savings over the life of the plant.

In addition to installing improved S/Gs, the licensee will be performing a major overhaul of secondary system components. These modifications include: removal and replacement of condenser internals with stainless steel components; feedwater heater and drain cooler replacement; condenser boot replacement; and increases in the blowdown and recirculation system pipe sizes and in capacity of the blowdown heat exchanger.

The construction of a centralized containment access facility is underway. This facility is designed to facilitate the access of approximately two thousand entries per day. This facility will include offices for radiation protection personnel, change areas, contamination monitoring, respirator and dosimetry issue, and protective clothing and decontamination material storage.

(8) Surrogate Tour System

The licensee has acquired a computer based video laser disk (surrogate tour) system. This system contains thousands of

pictures of the inside of the containment building. These pictures cover walkways, general access areas and many close-up pictures of components such as valves, gauges, and pumps.

In addition, the licensee intends to expand this system to cover the auxiliary building. Included in this system is a database feature that allows recording of dose rate information at predetermined locations. This dose rate information is then displayed, at the request of the user, during the surrogate tour. Currently, this information (dose rate) must be manually entered at the predefined locations. An electronic means of reading dose rates which is then automatically downloaded to the database could help minimize radiation exposure during initial data gathering and updating. Additionally, further dose reductions could be achieved if surrogate tour system training were provided to those responsible for planning and performing work in the RCA.

(9) Leak Reduction Program

Approximately one year ago, the licensee commenced routine walkdowns of primary plant systems to identify leaking components. Reportedly, all components are observed within a 45-day period, then the process starts over. During the walkdowns, boric acid residue is cleaned from leaking components. The valve packings are then tightened to reduce or stop the leakage. When serious or chronic leakers are found, work orders for maintenance are written. This program has the potential to reduce the spread of contamination and to reduce radiation exposure.

(10) Robotics and Automated Equipment

The licensee has used automated eddy current testing equipment for many years. However, this rig is an older SM-4 unit that requires significant refurbishment each outage and time to work out problems. The licensee is currently investigating a newer, no-entry type fixture for eddy current testing. Reportedly, most of these newer models would require some modification. Significant dose savings could be realized by utilizing up-to-date technology. Additionally, the licensee is investigating the acquisition of a scavenger robot to perform cleaning of tank bottoms.

(11) Contractor Performance Fee Program

The licensee has established a performance appraisal system for non-SGRP construction contractors. This system identifies critical success factors that directly support the overall objectives of the licensee's program. This system provides financial incentives for the contractor to achieve expected levels of performance. These performance goals are established in two categories. Category A consists of critical success

factors measured in the areas of Quality/Procedure Compliance, Schedule and Budget. Category B consists of Safety, Radiation Protection, Housekeeping and Security. This appears to be a flexible and responsive methodology to promote worker awareness and reduce exposure. This program appears successful in that during the last two maintenance outages contractor radiation protection performance has improved significantly.

(12) Plant Operations

The Plant Operations Department has commenced a dose reduction program. Reportedly, this includes detailed evaluations of Operations Department activities. Auxiliary Operator rounds are being reviewed to determine the need for certain equipment readings and their periodicity. The licensee plans to divide the overall operations RWP into four separate RWPs. The licensee expects to identify activities that cause/contribute the most exposure. In addition, the Plant Operations Department is holding its personnel accountable for their exposure. Reportedly, this includes explanations to management for exposures in excess of 10 mrem/day. If the results of operations activities evaluations are factored into practices/ procedures and are properly implemented, significant dose savings for operations personnel could be achieved.

(13) Design Initiatives

The licensee has identified numerous modifications and program enhancements. Many of these improvements have been discussed in preceding sections of this report. There have been notable successes; however, a number of projects are being deferred or cancelled. Cancellations and deferrals of modifications and the acquisition of improved, cost-effective technology is not indicative of strong management support for the ALARA Program. A summary of these project deferrals and cancellations are listed below:

- Shielding Software Package - Proposed in 1987 to expedite seismic evaluations was dropped in 1988.
- Containment Permanent Shielding - Was scheduled for 1990 but has been deferred until 1992.
- Reactor Head Shielding Upgrade - Scheduled for installation in 1990, but deferred until 1992, reportedly due to engineering problems.
- Radwaste Evaporator Evaluation - Scheduled for 1991 but deferred until 1992.

- Computerized RWPs - Reportedly, this project has been indefinitely deferred.

c. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA program.

Strengths:

- The strong ALARA/refueling engineering interface has resulted in significant dose savings.
- Improved design of new steam generators are expected to produce significant dose savings over the life of the plant.
- The contractor fee performance program has resulted in improved ALARA performance.

Improvement Items:

- Increase management support for ALARA design, modification and technology improvements.
- Develop a formalized, systematic cobalt reduction program.
- Provide training on the surrogate tour system to personnel who plan or perform work in RCA.
- Improve data collection methods for surrogate tour system.
- Update steam generator in service inspection technology.
- Update tool and equipment decontamination technology.

10. Assessment/Self-Evaluations

a. Effectiveness of Internal and External Audits

All audit reports supplied to the inspectors by the licensee were performed by licensee auditors with no reports by independent contractors. However, two contractor personnel are assisting with the comprehensive assessment of the RP program. The routine audit schedule includes an annual audit of all RP program elements by corporate QA personnel and quarterly surveillances by site QA personnel. The auditors are former RP department personnel and therefore able to conduct technically sound audits. In 1989, the audit approach was shifted from compliance towards performance based observations. This resulted in an improved audit report in 1989 that made four significant recommendations for improvement in the

ALARA program. However, no reply is required to recommendations in an audit report. The quarterly surveillances have consistently identified problems with work practices but have not focused on ALARA activities. Although the audits and surveillances are improving, the ALARA area has not been selected for increased attention at this time. QA management stated that increased attention could be provided to ALARA, if needed. The inspectors concluded that the primary assessments of the ALARA program are conducted by site personnel.

In a separate effort the licensee initiated a major project called the "HP Self-Assessment" in February 1990. This project uses innovative auditing techniques developed onsite by the Industry Experience and Assessment (IE&A) Department. Some unique characteristics include:

(1) A very detailed assessment plan is developed based on INPO documents, industry experiences, and NRC inspection findings. The plan results in a very large but highly structured data base of findings and observations.

(2) A permanent team consisting of two site RP personnel and two technical expert contractors, are provided on-the-job training by IE&A personnel throughout the project. Training includes interview techniques, data analysis methodologies, and analytical techniques. Other temporary team members are included for specialized areas and are similarly trained.

(3) The formulation of corrective action for identified deficiencies is done in "Alignment Meetings." These meetings between the team leaders, responsible managers and IE&A facilitators determine root causes and "align" the corrective action.

The HP Self-Assessment includes all areas of the HP programs onsite and will not be completed until July or August 1990. The licensee stated that appropriate corrective actions would be expedited to the maximum extent possible prior to the Steam Generator Replacement Outage later this year. However, because only some of the licensee-identified weaknesses could be resolved before the SGRP outage, the licensee stated that emphasis would be placed on priority items. Thus, the 1990 RP/ALARA self assessment corrective actions may have limited SGRP effectiveness.

b. Post-Job ALARA Reviews

The inspectors reviewed selected completed job packages which included post-job ALARA reviews. Most ALARA reviews indicated good sensitivity to ALARA concerns and provided good recommendations for improvement. However, the mechanisms to ensure implementation of the recommendations was not well defined.

c. Post-Outage ALARA Reports

The inspectors reviewed the 1988 Refueling Outage Report. Section II.A includes an analysis of ALARA activities in support of the outage. There were eight recommendations put forward, although most were administrative in nature. There was no separate review of ALARA performance.

A corrective action plan was drafted to followup on findings in the outage report. The plan was not implemented and the status of corrective action was indeterminate. Licensee personnel were uncertain as to when the plan would be reinstated. The inspectors concluded that the use of this post-outage review was ineffective. After the inspector concerns were brought to the licensee's attention, the SGRP RP/ALARA personnel extracted those recommendations which were desirable to incorporate into the SGRP ALARA program. Because of the relatively short time before SGRP outage activities begin, the 1988 refueling outage corrective actions may have limited SGRP effectiveness.

d. Identification of Chronic Plant Problems

The ALARA Coordinator analyzed the personnel exposures that occurred between 1983 and 1988 and identified four chronic problem areas as follows:

(1) Steam Generator inspections and repairs
(2) Reactor Refueling operations
(3) Health Physics technician exposure
(4) Valve repairs in the safety injection systems

The ALARA staff focused its efforts in these areas with mixed results. A high degree of success was achieved in reducing reactor refueling exposures, such that, it will be removed from consideration as a chronic problem. However, the three other areas remain problematic. Efforts to implement effective corrective actions are continuing by treating these areas as separate projects to enlist the support of the planning and work groups to identify exposure saving techniques. Station management has targeted completion of these efforts by 1991.

e. Summary and Conclusions

The licensee has not undertaken a complete audit or assessment of the ALARA program alone to identify the causes for the consistent poor performance. Auditing efforts thus far are conducted very well by highly qualified licensee personnel but have been directed at the broad area of RP programs.

f. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA program.

Strength: Began a comprehensive self assessment of the RP/ALARA Program.

Improvement Items:

- Be more timely in implementing corrective actions in response to ALARA weaknesses identified during the 1988 refueling outage and the 1990 self assessment.

- Focus auditing efforts on the ALARA program, using outside sources of information in support of assessment.

11. Exit Meeting

The scope and findings of the inspection were summarized on May 31, 1990, with those persons indicated in Section 1. The inspectors described the areas inspected, indicating that although the licensee had a generally adequate ALARA program, there was still room for considerable improvement in almost all areas of the program. The licensee acknowledged the inspection findings without exception. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspectors during this inspection.

ATTACHMENT 1

Collective Dose Analysis
for
Palisades Nuclear Generating Station

A. Collective Dose Per Reactor (Person-Rem/Year)

	1986	1987	1988	1989
Palisades	636	417	730	294
Average PWR (NUREG-0713)	390	371	336	*
% Difference	+63%	+12%	+117%	*
Rank (Highest)	8th out of 59	13th out of 64	4th out of 68	*

*Data Unavailable

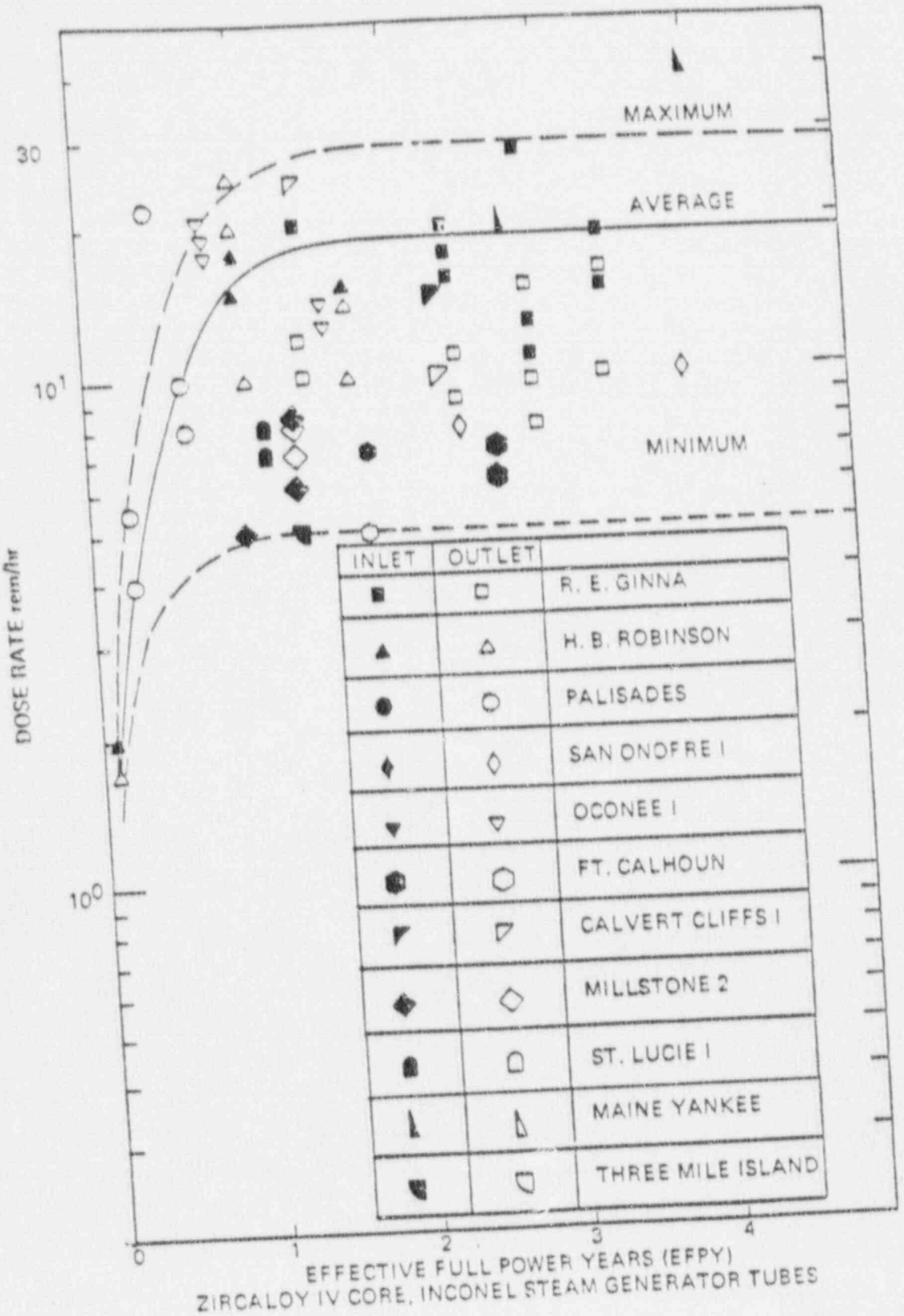
B. Annual Individual Dose (mrem/year)

	1986	1987	1988	1989
Palisades	442	373	500	286
Average PWR (NUREG-0713)	370	379	360	*
% Difference	+20%	- 2%	+39%	*

*Data Unavailable

C. Daily Collective Dose per Reactor (mrem/day)

	Non-Outage Dose Rate	Outage Dose Rate
Palisades (1986-1989)	330	2520
Average PWR >15 years old (Hinson 90)	149	4140
% Difference	+121%	-39%



STEAM GENERATOR TUBESHEET SHUTDOWN RADIATION LEVELS AT VARIOUS PWR's

Figu
E-3.1

ATTACHMENT 3

A. REPETITIVE HIGH DOSE JOBS DURING OUTAGES

Collective Dose Summaries
for
Palisades versus Combustion Engineering PWRs
(NUREG/CR-4254, May 1985)

Job Title	Collective Dose (person-rem)			Population Size	Palisades (person-rem)		
	Min	Max	Avg		1983 RFO	1985 RFO	1988 RFO
Steam Generator Tube Plugging	4.5	580	120	9	27.8	5.2	29.0
Reactor Disassembly/Assembly	20	160	68	13	95.2*	59.2	38.3
Snubber, Hanger, & Anchor Bolt Inspection and Repair	( )	20	34	12	1.1	2.4	2.4
Steam Generator Eddy Current Testing	3.1	140	31	16	135.0*	62.9*	46.9*
In-Service Inspection	0.58	49	24	14	91.0*	40.8*	30.4*
Reactor Coolant Pump Seal Replacement	5.6	64	18	15	__ **	3.7	4.8
Steam Generator Manway Removal/Replacement	1.5	26	9.9	15	18.0*	7.0	6.1
Fuel Shuffle/Sipping & Inspection	2.2	15	7.0	12	10.1*	2.0	4.6
Cavity Decontamination	1.8	11	5.3	12	__ **	3.2	6.9*
Totals	40	1300	320		390	190	170

*Indicates collective doses greater than average value for CE pressurized water reactors.

**Data Unavailable.

ATTACHMENT 3

B. REPETITIVE HIGH DOSE JOBS DURING ROUTINE OPERATIONS AND OUTAGES

Collective Dose Summaries
for
Palisades versus Combustion Engineering PWRs
(NUREG/CR-4254, May 1985)

Job Title	Collective Dose (person-rem) Min	Max	Avg	Population Size	Palisades (person-rem) Routine OPs & Outages 1985	1986	1987	1988	1989
Plant Decontamination	0.70	160	20	12	26.1*	4.9	24.4*	33.0*	12.7
Routine Op-Surv & Valve Lineups	7.0	22	13	6	13.5*	?.3	19.3*	11.6	16.5*
Instr Repair & Calibration	1.3	38	9.7	13	49.9*	12.7*	17.0*	13.5*	8.8
Pri Valve Maint & Repair	0 10	34	12	8	11.1	18.5*	29.6*	8.4	20.1*
CVCS Repair & Maintenance	0.6	8.3	4.8	3	38.5*	85.8*	29.4*	11.1*	12.3*
Shutdown Cooling System Repairs & Maintenance	0.96	0.96	0.96	1	59.6*	77.4*	49.7*	70.7*	7.2*
Totals	11	260	60		200	200	170	150	78

*Indicates collective dose greater than average value for CE pressurized water reactors.

ATTACHMENT 4

Total Adjusted Collective Doses (Excluding Special Maintenance (SM))

A. Palisades Doses (Person-Rem/Year)

Year	Total	SM	SM%	Adjusted Total
1986	636	5	0.8	631
1987	417	72	17.3	345
1988	730	75	10.3	655
1989	294	77	26.2	217

B. Average U.S. PWR Doses (Person-Rem/Year)

Year	Total	SM#	SM%	Adjusted Total
1986	390	120	30.4	270
1987	371	125	33.6	246
1988	336	110 @	32.0 @	226
1989	*	*	*	*

* Data Unavailable
\# NUREG-0713
@ Since data is not available, 1988 SM percent of average U.S. PWR dose was assumed to be the average of the 1986 and 1987 SM percents.

JUN 6 1990

Docket No. 50-373
Docket No. 50-374

Commonwealth Edison Company
ATTN: Mr. Cordell Reed
Senior Vice President
Post Office Box 767
Chicago, IL 60690

Gentlemen:

This refers to the special team assessment conducted by Mr. William Snell and others of this office, NRC Headquarters, NRC Region I, and Brookhaven National Laboratory on April 22-27, 1990, of activities at LaSalle County Nuclear Station, Units 1 and 2, authorized by Operating Licenses No. NPF-11 and No. NPF-18 and to the discussion of our findings with Messrs. D. Galle and G. Diederich and others of your staff at the conclusion of the inspection.

The assessment was conducted to evaluate the effectiveness of licensee actions to keep radiation doses at the LaSalle Station as low as reasonably achievable (ALARA). The team used selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress to perform the evaluation.

While Commonwealth Edison's ALARA program as it relates to the LaSalle station appears to be generally adequate, the inspection identified a number of areas for your consideration to improve the effectiveness of the program. Inasmuch as the radiation source term at the LaSalle Station appears to be lower than that found in comparable facilities, we conclude that the work scope and practices are likely the primary cause for the high exposures which have been experienced. A number of notable strengths and improvement items are described in Enclosure 1 and are discussed in detail in the enclosed report. Within the scope of the assessment, no violations or deviations were identified.

After you have completed your evaluation of this report, we would like to meet with you to discuss your evaluations of our findings.

In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of this letter and its enclosures will be placed in the NRC Public Document Room.

9006130149

We will gladly discuss any questions you have concerning this assessment.

Sincerely,

Charles E. Norelius, Director
Division of Radiation Safety
and Safeguards

Enclosures:
1. Executive Summary
2. NRC Inspection Reports
   No. 50-373/90008(DRSS);
   No. 50-374/90009(DRSS)

cc w/enclosures:
D. Galle, Vice President - BWR Operations
T. Kovach, Nuclear Licensing Manager
G. J. Diederich, Station Manager
DCD/DCB (RIDS)
Licensing Fee Management Branch
Resident Inspector, RIII
Richard Hubbard
J. W. McCaffrey, Chief, Public Utilities Division
Patricia O'Brien, Governor's Office of Consumer Services
R. Pulsifer, NRR LPM

bcc w/enclosures:
R. R. Bellany, NRC, RI
D. M. Collins, NRC, RII
B. Murray, NRC, RIV
G. P. Yuhas, NRC, RV
C. S. Hinson, NRR, PRPB
R. L. Nimitz, NRC, RI
B. Dionne, BNL
J. Baum, BNL

RIII	RIII	RIII	RIII	RIII	RIII	RIII	RIII
Paul/gd	Gill	Janiska	Schumacher	Snell	Hinds	Greger	Norelius
6/	6/3/90		6/	5/30/90		6/4	6/6

ENCLOSURE 1

Executive Summary

During 1987 and 1988 the annual collective radiation doses at the LaSalle County Generating Station exceeded the national average for Boiling Water Reactors (BWRs). For 1987 the dose per reactor (697 person-rem) was 36 percent above the national average of 513 person-rem. This placed LaSalle fifth highest out of 33 U.S. BWRs for 1987. For 1988 the dose per reactor (1236 person-rem) was 134 percent above the national average of 529 person-rem. This placed LaSalle second highest out of 34 U.S. BWRs for 1988. During 1989 the collective dose per reactor was 692 person-rem. Although the 1989 national average collective dose was unavailable, it appears certain that LaSalle will again have exceeded the average for U.S. BWRs. It appears, based on data available to date, that LaSalle may be near the national average for 1990, which would continue the downward trend since 1988.

During the period of April 22-27, 1990, a special team assessment was conducted by the NRC to evaluate the licensee's efforts for maintaining occupational radiation doses as low as reasonably achievable (ALARA). The assessment included a review of the causes of the past high radiation doses; an evaluation of the licensee's current organization and program for keeping radiation doses ALARA; a review of the initiatives the licensee has taken or is taking to bring the radiation doses to within industry norms; and an assessment of licensee management's awareness of, involvement in, and support for the ALARA program.

The team concluded that inasmuch as the radiation source term at the LaSalle plant appears to be lower than that found in comparable facilities, the work scope and practices are likely the primary cause for the high exposures which have been experienced. The team found a high level of plant and corporate management awareness and support for the ALARA program. Although the licensee has been implementing a formal ALARA program since initial plant startup in 1982, the high annual collective dose in 1988 brought additional attention to the program. This additional attention has prompted numerous program changes and upgrades, from which tangible results are being realized. Recognizing the ALARA program was still evolving, and considering the progress that had been made over the past three to five years, the team concluded that many of the areas identified as needing improvement may have eventually been independently identified and addressed by the licensee.

The licensee's ALARA program was found to be generally adequate; however, a number of areas where improvement would benefit the overall ALARA efforts were identified by the inspection team. Program strengths and areas where the program can be significantly improved are summarized as follows:

Strengths

- Broad and effective corporate support for the LaSalle Station ALARA program.

- Aggressive dose reduction program with respect to program and equipment initiatives.

Items for Improvement

- Conduct continuing comparisons of radiation dose data at LaSalle with that for average U.S. BWRs to identify areas where improvement is warranted, and evaluate/implement corrective actions as appropriate to reduce doses.

- Implement an ALARA suggestion/incentive program.

- Expand the training program to address: advanced radiation worker training; ALARA staff qualification and on-the-job training; and design engineering ALARA training.

- Upgrade the quality of the mockup training to make it more realistic.

- Upgrade overall quality, content and guidance contained in RWP and ALARA procedures to ensure jobs are reviewed on sub-task bases and to ensure appropriate dose and contamination reduction techniques are considered.

- Formalize and upgrade the criteria for performing ALARA job reviews and post-job evaluations.

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report Nos. 50-373/90008(DRSS); 50-374/90009(DRSS)

Docket Nos. 50-373; 50-374 Licenses No. NPF-11; NPF-18

Licensee: Commonwealth Edison Company
Post Office Box 767
Chicago, IL 60690

Facility Name: LaSalle County Station, Units 1 and 2

Inspection At: LaSalle County Station, Marseilles, Illinois

Inspection Conducted: April 22-27, 1990

Inspectors: M. Shamsha for — 6-6-90
R. A. Paul — Date

C. F. Gill — 6/6/90
C. F. Gill — Date

A. G. Januska — 6/6/90
A. G. Januska — Date

Accompanied By:
C. S. Hinson, NRC, NRR
R. L. Nimitz, NRC, RI
B. Dionne, NRC Contractor, BNL
J. Baum, NRC Contractor, BNL

Approved By: William Snell — 6/6/90
William Snell, Chief — Date
Radiological Controls and
Emergency Preparedness Section

Inspection Summary

Inspection from April 22-27, 1990 (Reports No. 50-373/90008(DRSS); No. 50-374/90009(DRSS))
Areas Inspected: Special, announced assessment of the ALARA program (IP 83728).
Results: The licensee has implemented an adequate ALARA program, that with further development has all the elements necessary to become a good program. However, there were many areas identified where actions could be taken to improve the program. Some of the areas where significant improvement could be achieved included training, dose reduction for major job tasks, HP staffing for ALARA activities, and ALARA procedures. No violations or deviations were identified.

9006130155

DETAILS

1. Persons Contacted

NRC Inspection Team

W. Snell, Team Leader, NRC RIII
R. Paul, NRC, RIII
A. Januska, NRC, RIII
C. Gill, NRC, RIII
C. Hinson, NRC Headquarters
R. Nimitz, NRC, RI
B. Dionne, Brookhaven National Laboratory
J. Baum, Brookhaven National Laboratory

Licensee

D. Galle, VP, BWR Operations
G. Diederich, Station Manager
D. Hieggelke, Health Physics Supervisor
W. Luett, Operational Lead HP
C. Kelley, ALARA Coordinator
J. Renwick, Production Superintendent
F. Rescek, Radiation Protection Director, Corporate
J. Atchley, Operating Engineer
W. Sheldon, Assistant Superintendent Maintenance
F. Lawless, Regulator Assurance, Corporate
P. Nottingham, Chemistry Services Supervisor
T. Shaffer, Training Supervisor
W. Huntington, Technical Superintendent
J. Walkington, Services Director
T. Hammerich, Regulatory Assurance Supervisor
D. Berkman, Assistant Superintendent Work Planning
L. Bryant, Rad Protection Foreman
J. Steinnetz, ENC-NO Construction Superintendent
H. Massin, Project Management
L. Lauterbach, Onsite Nuclear Safety Supervisor

All of the above personnel, except for J. Baum of the NRC inspection team, attended the exit meeting on April 27, 1990. In addition to the above persons, additional licensee and NRC personnel attended the exit meeting, and additional licensee personnel were contacted during the course of the inspection.

2. Dose Evaluation

The licensee began the implementation of the program to maintain occupational exposure as low as reasonably achievable (ALARA) during initial startup in April 1982. Commonwealth Edison Company (CECo) instituted the company's ALARA policy statement in 1976. Reducing radiation exposures to levels that are ALARA has long been an acknowledged goal for LaSalle County Station, as well as for CECo in general.

This inspection was prompted in large part by the high annual collective dose experienced in 1988 at the LaSalle County Nuclear Generating Station. An analysis of the licensee's radiological dose data was performed in an attempt to identify causes for the high collective doses, as well as to evaluate the effectiveness of the licensee's efforts to reduce dose at LaSalle (Attachments 1-4). The inspection also included a systematic review of the major elements of the licensee's ALARA program and an evaluation of the effectiveness of its implementation. Recommendations to strengthen the program are documented in this report.

The collective dose per reactor from 1986 to 1989 for LaSalle was compared with that for the average U.S. Boiling Water Reactor (BWR) (Attachment 1). In 1986 LaSalle was 27% below the average collective dose for BWRs. This increased in 1987 and 1988 to +36% and +134%, respectively. The collective dose per reactor for LaSalle dropped from 1236 in 1988 to 692 person-rem in 1989, and is expected to be between 40 to 60% greater than the average U.S. BWR in 1989. LaSalle's collective dose ranked 11th highest out of 30 U.S. BWRs in 1986, 5th out of 33 U.S. BWRs in 1987, 2nd out of 34 U.S. BWRs in 1988, and is expected to rank in the upper quartile of the group in 1989.

A review of the average individual dose was performed for the period 1986 to 1988 (Attachment 1). LaSalle's average individual dose was twice the average annual dose for BWR radiation workers in 1987 and 1988. The average individual dose decreased in 1989 at LaSalle to 560 mrem/yr, but is still expected to be about 40-50% higher than the BWR average.

A review of the daily collective dose per reactor was performed to determine if the average daily doses being expended during non-outage and outage periods were higher than that being experienced at other BWRs (Attachment 1). LaSalle's daily collective dose per reactor was 70% higher than other BWRs during non-outage periods and 25% higher during outage periods.

In an attempt to determine if the increased exposures were due to higher than average plant dose rates, a comparison of shutdown radiation levels was performed. Attachment 2 presents a comparison of LaSalle's radiation levels during the most recent shutdowns. This table compares LaSalle's dose rates with those which have been published in the literature. A limited review of this information indicated that LaSalle's dose rates are generally low compared to those presented in NRC, EPRI and Stone & Webster reports.

To further identify the potential causes for the elevated collective doses, a review of the repetitive high-dose jobs from both outage and non-outage periods was conducted. The collective doses for LaSalle repetitive high-dose jobs from L2R01 (LaSalle Unit 2, refuel outage Number 1), L1R02, L2R02, and L1R03 were compared against those reported in NUREG/CR-4254 (Attachment 3). All repetitive high-dose jobs from refueling outages appeared to be within the range of collective doses published in NUREG/CR-4254.

The collective doses for LaSalle's repetitive high-dose jobs which were conducted during routine operations and non-refuel outages were also compared against those reported in the above NUREG (Attachment 3). Primary valve maintenance and repair; plant decontamination; operations-surveillances, routines and valve lineups; and radwaste systems repair, operation and maintenance, were in general greater than the collective dose range reported in the NUREG/CR-4254.

A review of the non-repetitive outage high-dose jobs was performed to determine the effect the large amount of modification work and it's associated dose had in the high exposures incurred in 1987 and 1988 (Attachment 4). During 1987, 572 person-rem was expended on the major modifications and repairs performed during L2R01. This represents about 40% of the total station collective dose. During 1988, 1146 person-rem was expended on the major modification and repairs performed during L1R02 and part of L2R02. This represents about 45% of the 1988 total station collective dose. During 1989, 467 person-rem was expended on the major modifications performed during part of L2R02 and L1R03. This represents about 35% of the 1989 total station collective dose. Therefore, it appears that the dose associated with major modifications and repairs has accounted for a large portion of the total dose at LaSalle between 1987 and 1989. Discussions with licensee representatives indicated they had not conducted the "big picture" type of reviews conducted above as a means of identifying the major causes of high doses at LaSalle.

Based on the above review, this portion of the licensee's program is adequate. However, the following item is recommended to strengthen the ALARA program.

- Conduct continuing comparisons of radiation dose data at LaSalle with that for average U.S. BWRs to identify areas where improvement is warranted, and evaluate/implement corrective actions as appropriate to reduce doses.

3. ALARA Program/Organization

a. ALARA Program

LaSalle's ALARA policy statement is documented in CECo's Production Instruction No. 1-3-N-2 and described in the company ALARA Manual. The primary objective of the ALARA concept is to reduce personnel radiation exposure to the lowest levels achievable commensurate with sound economic and operating practice. CECo's ALARA Manual contains a detailed description of the companies' ALARA program and defines the resources/requirements necessary to meet the ALARA objectives. One of these requirements is strong management support for the persons responsible for carrying out the day-to-day activities of

protecting radiation workers. It appears that management has become much more sensitive to ALARA and supportive of the ALARA program progressively over the last five years. Management's concern with ALARA is evidenced by the fact that the meeting of dose goals is one of the elements in each employee/management performance appraisal. Management's support of ALARA is apparent in some of the "big picture" ALARA advances being studied at the corporate level for implementation at the CECo plants. The company's Plan-For-Excellence goals include corporate evaluation of such ALARA initiatives as cobalt reduction in various plant components and the use of hydrogen addition.

b. Corporate Organization

The Corporate Office has a staff of 10 professionals in the field services and ALARA function, including one certified health physicist. Of these, one is assigned to LaSalle and spends about 30-40% of his time on ALARA activities with about 50% of this time on-site. In addition, the Corporate Radiation Protection Director has been at LaSalle on several occasions during the past three years and an additional health physics professional spent three to four months on-site during 1988.

At the corporate level, the Radiation Protection Director is tasked with carrying out the ALARA program. He appears to have a good rapport with the station radiation protection department and meets with the station Health Physics Services Supervisor on at least a monthly basis. The Radiation Protection Director is the head of the Nuclear Services Radiation Protection Organization. This organization allocates resources to and serves as an internal consultant for the six CECo nuclear stations. This organization also performs an ALARA assessment function for the CECo stations and disseminates information to these stations on the latest industry advances in ALARA.

Corporate Senior Management support and oversight occurs through the Corporate ALARA Committee (CAC) which reports to the Senior Vice President, Nuclear Operations. The purpose of the CAC is to guide corporate ALARA activities and evaluate overall corporate performance in maintaining radiation doses ALARA. The CAC meets on a quarterly basis and one of the committee's functions is to review the station's dose reduction goals and review ways to reduce station dose to meet these goals.

The Corporate Nuclear Services Radiation Protection (NSRP) department is responsible for providing specific direction and support of the stations' ALARA programs. Some of the actions taken by the NSRP have included the performance of several ALARA assessments for stations experiencing significant person-rem overruns when compared to their goals, modification of the station person-rem goal development process to include senior management review and approval, and approval for use of $5000 per person-rem for performing cost benefit evaluations.

c. Station Organization

The station ALARA programs are guided by the Station ALARA Committee (SAC) which is comprised of upper management station personnel including the Station Manager, Health Physics Services Supervisor, ALARA Analyst, and heads of the Production, Technical, Services, and Site Construction groups. The SAC is responsible for developing the ALARA goals for the station, making recommendations for reducing personnel exposure, and providing guidance and recommendations on aspects of radiological operations. The SAC provides periodic progress reports to the CAC. The SAC meets on a monthly basis and is well attended by the SAC members and other site personnel.

The station Radiation Protection Department, headed by the Health Physics Supervisor, coordinates the ALARA effort at the plant. Within the department an Operational Health Physics Support Group is responsible for ALARA in addition to such tasks as exposure and contamination control and respiratory protection. The Radiation Protection Department complement is 60, including 34 Radiation Protection Technicians (RPTs) and six radiation protection foremen. During major outages the RPT crew complement is typically more than doubled by the addition of contractor RPTs. In addition to the Radiation Protection Department personnel, there are currently three ALARA Coordinators who are part of the site contractor organization. They work to ensure appropriate contract worker participation in the ALARA program and assist the station ALARA Analyst in formulating the station annual dose goals.

The six individuals comprising the Operational Health Physics Support Group each have lead responsibility for a separate program area such as ALARA, respiratory, shielding, etc.; backup responsibility for one of the other group members program area; and responsibility for assigned special projects. Only one of these individuals is assigned ALARA as their primary responsibility (ALARA Analyst), while the others have related and supporting responsibilities. During plant outages the expanded responsibilities and work load of these assigned program areas, in conjunction with additional project assignments, strains the capabilities of the Operational Health Physics Support Group. This is especially true for the ALARA analyst, whose duties include working with the SAC, department heads, and contractor ALARA Coordinators in formulating the annual dose goals. During outage periods, he must also be concerned with dose goal overruns and doses from unplanned jobs. The inspector's discussions with the staff indicated a considerable amount of overtime is used to accomplish work. For example, one individual (not the ALARA Analyst) was noted to have worked an average of about 70-80 hours per week during the first part of the Unit 2 outage. The fact that the work was not ALARA related means the remaining staff had to carry out the ALARA work activities with less people at a time when the workload had increased. This may indicate a need for additional staff in the area of ALARA activities during major outages.

It appears that the ALARA Analyst could also benefit from additional assistance. One of the responsibilities of the ALARA Analyst is the maintenance of detailed job history files containing pre-job interviews, job descriptions and working conditions, RWPs, and post-job meeting notes with lessons learned. The job history files are used for future job planning and dose goal estimates. It appears, based on an interview with one of the ALARA Coordinators, that the demands of the job prevent him from adequately compiling lists of lessons learned to be included in each job history package. Lessons learned are a very important part of the ALARA program, which can contribute to lower doses being realized during performance of future jobs.

d. Qualifications

The inspectors reviewed the qualifications of several of the health physics personnel. The Radiation Protection Director has been employed in the radiation protection field with the company for the past 14 years and appears to be very well qualified for the position. The Health Physics Services Supervisor has held various health physics positions at LaSalle since plant startup and meets the Regulatory Guide 1.8 guidelines for the plant Radiation Protection Manager. Thirty-one of the thirty-four RPTs meet the 2-year ANSI 18.1 experience criteria for qualified RPTs. Two ALARA Coordinators interviewed appeared to be well qualified for the jobs they held.

e. ALARA Suggestion/Incentive Program

A good ALARA suggestion/incentive program can be an important part of a plant's ALARA program. A good ALARA suggestion program can result in the receipt of useful dose reduction ideas that can be used to lower the station's total collective dose. The addition of incentives for good suggestions usually results in a greater number of suggestions being received. LaSalle currently does not have an ALARA suggestion/incentive program. The inception of such a program at LaSalle could increase overall employee awareness of ALARA and could result in the receipt of some useful dose reduction suggestions.

Based on the above review, this portion of the licensee's program is adequate. However, the following item is recommended to strengthen the ALARA program.

- Implement an ALARA suggestion/incentive program.

4. Corporate Involvement

As a result of higher than predicted collective doses at LaSalle County and Zion Stations in early 1988, a multi-disciplinary group was commissioned by the Corporate ALARA Committee (CAC) to perform special

reviews at each site. A four-member team performed the review at LaSalle on May 9-13, 1988, and a written report with several suggested improvements was completed.

The CAC directs corporate ALARA activities, meets quarterly, and evaluates corporate performance in maintaining radiation doses ALARA. Vice President's Instruction No. 1-0-27 was completed on December 1, 1989. It established and authorized the CAC which had already been functioning through guidance given in the ALARA Manual since about 1983. The V.P. Instruction outlines responsibilities, rules of operation, frequency of meetings, and minimum topics of discussion. A review of minutes of CAC meetings, and year-end reports reveals appropriate topics are being addressed and that the committee is providing useful guidance. A health physicist from the Corporate staff is currently visiting several non-CECo utilities to search out potential dose reduction actions. There is need for continuing identification of dose reduction actions with long-term benefit, performing engineering cost-benefit studies, and prioritizing the various possibilities in terms of dose reduction cost effectiveness ($/person-rem). CECo studies on cobalt reduction, Zn injection and decontamination of primary systems are examples, but the list should be expanded and periodically updated as conditions change and new possibilities arise. This is an area where corporate help could be important since many items such as cobalt in valves have multi-plant applicability.

Prior to this assessment, the licensee was requested to respond to a 51-item questionnaire related to ALARA activities at the LaSalle Station and corporate. Based on answers to the questionnaire, and subsequent discussions and materials reviewed, it is apparent that important dose control and dose reduction actions, and equipment upgrades were implemented. The licensee has implemented studies concerning improved operation and cleaning of resin beds, possible reduction of Co-60 release by extending depressurization time during shutdown, use of hydrogen water chemistry, material transport, and valve packing.

Overall, the corporate support is broad and generally effective as evidenced by support in the areas of management training (e.g., holding "ALARA-Radiation Protection Awareness Day" seminars), encouragement of communication between plants, development of cost-benefit criteria ($/person-rem), computer assistance in task analysis, development of job (RWP) specific computer-assisted dose tracking, assistance in developing and tracking five-year strategic goals and plans, and the inclusion of a performance goal, based on a percentage of the plant collective dose for the year, in the various plant department managers performance ratings.

Based on the above review, this portion of the licensee's program is adequate.

5. Training

The inspectors reviewed the licensee's ALARA training program, including radiation worker, radiation protection technician (RPT), mockup, and general employee training (GET). Also reviewed were facilities; instructor qualifications; ALARA staff professional development; and the interface between operations, maintenance, radiation protection, and training departments.

a. Personnel ALARA Training

The inspectors reviewed the radiation protection GET program to determine the adequacy of ALARA/RWP instruction, including lesson plans, handout material, instructor manual, visual aids, training facilities, sample examinations, and instructor qualifications. It was concluded that the ALARA/RWP portion of the course covered the necessary fundamentals, examinations adequately tested the students' knowledge (both theoretical and practical applications), facilities were somewhat primitive but adequate, and there was appropriate instructor/student interface to reasonably assure that students adequately understood fundamental concepts. Additionally, the review of the RPT training led to the conclusion that the formalized qualification/OJT program for staff RPTs reasonably assured appropriate RP/ALARA/RWP training. However, because contractor RPT training consisted mostly of a screening examination and procedural familiarization, there is less assurance that these individuals will perform RP/ALARA/RWP duties in an appropriate manner.

The licensee does not presently conduct an advanced radiation worker training class beyond the teaching of RP/ALARA/RWP fundamental concepts during the one-day GET course. Although the licensee is considering the development at all licensee nuclear stations of a three or four-day course which would provide practical application training of RP/ALARA/RWP concepts for those workers who routinely must wear protective clothing, work in contaminated areas, and contend with significant dose rate environments, the full implementation of the proposed program may not occur for several years (according to licensee representatives). Section 7 describes several examples of workers who were observed during this assessment to demonstrate inadequacies in their fundamental ALARA training by waiting in relatively high dose rate areas, rather than moving to nearby known low dose rate areas.

Although the licensee does not have an advanced radiation worker training course, the contractor who supplies general laborers and craft workers has developed and implemented an RWP/ALARA/PC training course for all new station contract employees. This training course is given after completion of the licensee GET and consists of five hours of instruction regarding ALARA awareness, radiological work practices, and good general work practices. The training includes

practical factors by instructing the workers to follow the requirements of a mock licensee work package, including RWP, dosimetry, and dose card requirements. The attendees are required to pass a practical factors short answer/essay examination before being granted site access. After being granted site access, the contract workers are given an orientation plant tour. Also, contract workers who have had little or no prior nuclear experience are given practical protective clothing training which is an extension of the PC training given during licensee GET. The inspectors reviewed the lesson plans and discussed the details and objectives of these training courses with the contractor ALARA Coordinator; no problems were noted. The contractor's RWP/ALARA/PC training beyond the fundamental GET is an example of good performance at the LaSalle Station and is an interim program enhancement, pending development and implementation of a licensee advanced radiation worker training course for both licensee and contractor employees.

The inspectors interviewed selected members of the HP Operational Support/ALARA/RWP staff, reviewed their qualifications, and assessed their professional development program. The seven staff members all had the appropriate radiation protection background and appeared to have been assigned tasks which were appropriate to station ALARA programmatic goals. However, the ALARA personnel occupy management positions and therefore do not participate in RPT qualification/OJT training, or any other formal training program pertinent to their ALARA assignments. This lack of a formalized training program to ensure ALARA personnel are generally knowledgeable regarding ALARA programs and are kept apprised of current ALARA developments, appears contrary to the licensee's stated policy of aggressively pursuing ALARA program improvement initiatives. Also, all staff members have similar professional backgrounds (RP) and thus may collectively lack sufficient breadth to optimize the ALARA process when coordinating activities with other departments. It appears desirable to add ALARA staff members with significant background in other disciplines (such as maintenance and operations) and to assure that staff members with primarily RP backgrounds have an adequate professional development program which would allow the members to become sensitive to the needs of worker task assignments and associated radiological hazards. The inspectors also discussed the benefits of participation in various industry ALARA seminars and workshops, exchange programs with other utilities during special outage activities, participation in licensee system training courses, and temporary assignments for special plant maintenance related activities. Although the licensee has occasionally been involved in some of these activities, this effort to date appears to have been minimal.

The inspectors reviewed the status of the licensee's program for ALARA training classes for design engineers. The potential concern was that if equipment, system components, or tools were not designed with the application of appropriate ALARA concepts, additional worker radiation exposure might occur. Although the station routinely develops special equipment and tools for application to the maintenance, repair, and operation of plant systems, the licensee has not developed a training course for the station personnel involved with the design and fabrication of special tools and equipment. However, for certain design modifications specified by Corporate Engineering and Construction Procedure No. ENC-QE-06, the modification reviews, including ALARA, are assigned to the Corporate Nuclear Engineering Department (NED) as required by the Corporate QA Manual. Exhibit A of this procedure is an 18-page ALARA Design Review Checklist which appear to contain appropriate ALARA review items. In December 1988, the licensee with consultant assistance prepared a 40-page ALARA design guide to provide instructions on review details associated with each ALARA checklist item. Approximately one year ago, a two-day corporate course was given to selected design engineers on the use of the ALARA checklist and design guide. In part, because the developer of the training course has been reassigned, the class was never fully developed and the design engineers are using the guidance documents without benefit of formalized training.

b. Departmental Interfaces

The inspectors reviewed the ALARA training interfaces between the operations, maintenance, radiation protection, and training departments. In general, training department group leaders are assigned to coordinate training with departmental (operations, maintenance, and services) training coordinators. It appeared to the inspectors that these practices are generally effective. The training department has several mechanisms to incorporate ALARA concerns/suggestions/lessons-learned into the training program. These include internal memoranda, general information notifications, and quarterly management and continuing training meetings during which training department members meet with their counterparts from the operations, maintenance, and services departmerts. The procedure which describes the methods, documentation and approvals required to revise and develop training materials is No. LAP-620-2, Revision of Training Program Materials. When feedback is received which indicates changes are needed to support training on a given task, the necessary information is incorporated into the action assignment form (Program Development/Maintenance Record). The inspectors' selective review of the documentation associated with this process indicated it was generally well implemented. However, very few of the modifications reviewed appeared to be prompted by ALARA concerns. Inspector documentation reviews and personnel interviews indicated the potential for ALARA training program changes, based on task related lessons-learned, rely mainly on the training department's review of the station outage reports. Because

these reports often do not directly state that some task-related problems may be due to ineffective training, the present system of incorporating lessons-learned into the training program does not appear effective.

Licensee representatives were interviewed to solicit opinions on possible means of rectifying this apparent deficiency. Among the suggestions were assigning training department members to attend and participate in post-job reviews and soliciting better outage work feedback on the ALARA training program from the operations, maintenance, and radiation protection departments.

c. Mockup Training

The inspectors reviewed mockup training and facilities for control rod drive (CRD) removal, rebuild, and installation; recirculation pump seal replacement; and valve repair. Also reviewed were the lesson plans and the instructor qualifications. In addition, the inspectors discussed with appropriate licensee personnel the scope of the training courses, how well the mockup training reflected the as-found field conditions, and the level of involvement of RP/ALARA personnel in the development of and participation in mockup training. The training department group leaders and mockup training instructors appeared well qualified, dedicated to high training standards, and worked well with departmental (operations, maintenance, and services) training coordinators. However, the reviews and discussions indicated that, generally, licensee mockup training has concentrated on teaching attendees about the equipment components and task details without adequately simulating expected field conditions such as the wearing of PC and respirators, space restrictions, anticipated RP hold points, and the details of the work evolution to assure minimal dose under anticipated work conditions. Individuals interviewed also indicated that there had been occasions, in their opinions, of insufficient RP/ALARA involvement in the development of and participation in mockup training courses. According to several members of the licensee's management staff, the problems associated with unrealistic mockup training during the current outage were demonstrated by workers being unprepared for certain field conditions, which increased the time necessary to complete the scheduled tasks and appeared to unnecessarily increase worker radiation exposure.

Based on the above review, this portion of the licensee's program is adequate. However, the following items are recommended to strengthen the ALARA program.

- Develop formalized training programs for advanced radiation worker training and ALARA staff qualification/OJT and professional development.

- Complete implementation of the formalized ALARA training course regarding design engineering.

- Improve the system for modification of the ALARA training program in response to lessons learned.

- Improve the quality of the mockup training to ensure it adequately reflects field conditions.

6. Management Goals

To assist each station in measuring its performance and to identify radiation work that requires additional exposure reduction and planning and ALARA action, CECo has implemented a radiation exposure goals program which is described in its ALARA Manual. Each year each station department is requested to develop annual estimates for collective radiation exposures, percent of general access area contaminated, and personnel contamination events (PCEs).

The inspector reviewed the licensee's process for calculating annual collective radiation exposure goals for the LaSalle plant. The process begins three to six months before the end of the year by establishing dose estimates for each station department for the following year based on predicted work load, with the knowledge of historical dose and manpower information included when available. These initial estimates are reviewed and refined by the joint effort of the ALARA Coordinator and each department. Eventually these estimates become goals agreed to by the department and the Station ALARA Committee (SAC). The sum of the individual departmental goals becomes the stations ALARA goal. This goal is reviewed by the SAC to ensure that it is both challenging and realistic; if deemed too high, SAC can lower this goal as it did in 1990 when the goal was changed from 950 to 875 person-rem.

Although the licensee's goal setting practices are not covered by formal procedures, the system appears to work well. Throughout the goal setting process, the ALARA Coordinator works with the SAC to refine and reduce the dose estimates through the application of ALARA techniques such as shielding, work preplanning, and the use of fewer workers.

The approved station dose goals are forwarded to the Corporate ALARA Committee (CAC) for review and comparison with the industry average and the better performing plants in the country. Sometimes, suggestions from this review are forwarded to the Station Manager for consideration in changing the station's goal.

Final dose goals are established by the end of the year for the following year. The annual dose goals for each department are broken down into monthly goals and are also broken down by major jobs (jobs estimated to exceed 20 person-rem). The Radiation Protection Department monitors plant performance daily relative to these goals and sends comparisons between actual dose and the dose goals each month to the Station Manager and the department heads. This monthly tabulation includes explanations for any department dose overruns. During the year, station goals may be changed if required. For example, if it becomes necessary to perform an

unplanned high dose job that will cause the plant dose goal to be exceeded, the ALARA Analyst will meet with the respective job department head beforehand and decide whether it warrants revision of the plant dose goal.

The station annual goals for 1987 and 1988 were revised upward during the year, but were still exceeded by the end of the year (Attachment 6). However, in 1989 the licensee did not exceed its original dose goal of 1400 person-rem. The 1990 dose goal is 875 person-rem and as of April 15, 1990, the licensee had accrued 421 person-rem compared with the projected dose goal of 340 person-rem for this date. However, the annual goal still appears reasonable because a significant fraction of the high dose outage work was completed ahead of schedule.

The dose estimates used by the licensee appear to be sound and fairly accurate. Each year the dose goals appear to more accurately reflect the actual doses. This is probably due to availability of more historical job person-rem and man-hour data as the plant ages. The continued fine tuning of the plant dose goals coupled with an increased worker awareness of the importance of not exceeding these dose goals should result in better dose projections and in an overall reduction in station doses at LaSalle.

Based on the above review, this portion of the licensee's program is adequate.

7. ALARA/RWP Procedure Implementation

a. ALARA/RWP Procedures

The licensee uses a radiation work permit to delineate the radiological control requirements to be implemented for radiological work activities. Procedure LAP-100-22, Revision 6, Radiation Work Permit, provides an explanation and flow path for use of the radiation work permit (RWP) program. The procedure provides criteria for issuing an RWP, approving an RWP, and implementing the RWP.

There are two types of RWPs. The Type 1 RWP is required for all routine access or work in radiologically controlled areas where personnel are not expected to exceed a whole body dose equivalent of 50 mrem/day. The Type 1 is valid for one year and is reviewed weekly by a radiation protection supervisor and the job supervisor. If a Type 1 RWP is deactivated, it will be reviewed by a radiation protection supervisor prior to reactivation.

A Type 2 RWP is required for all access or work in radiologically controlled areas where personnel are expected to exceed a whole body dose equivalent of 50 mrem/day. In addition, a Type 2 RWP may be

required for jobs involving significant contamination and/or airborne radioactivity. Type 2 RWPs are valid for the duration of the job and require a shiftly review by radiation protection supervisors.

Both Type 1 and Type 2 RWPs require that operating supervisors read and understand them, that a periodic review frequency be determined or if a periodic review by an operations supervisor is not required, that the reason for not performing the review be documented, that Type 1 RWPs have an initial survey prior to the start of the work on that RWP, and that all active Type 1 RWPs be resurveyed.

An ALARA "checklist" is required to be completed for each Type 1 and Type 2 RWP. The checklist is completed by radiation protection personnel. The checklist provides criteria, which if met, require the performance of an ALARA action review. The checklist is required to be signed by the job supervisor and radiation protection supervisor. All ALARA reviews greater than 30 person-rem are required to be reviewed by the Station ALARA Committee (SAC) or cognizant persons that can appraise exposure reduction for the task. A review of the various forms contained in the RWP package indicated they are not human factored to allow workers to readily identify their responsibilities relative to ALARA.

The ALARA action review procedure requires that person-rem saved through the ALARA action review process be documented in the ALARA action review follow-up and tabulated on the RWP reports system. Although the procedure does not require that unnecessary exposure (e.g., due to re-work or error) be documented and trended or evaluated, the reason for the unnecessary exposure was being documented; however, it was not being trended.

The ALARA action review procedure also provides for ALARA outage preparation for high exposure jobs, high contamination potential jobs or other work which could benefit greatly from ALARA pre-planning. The pre-outage review is used as an aid to ensure that outage supplies are adequate and/or ordered in advance of the outage start dates. However, the procedure does not define appropriate lead times for submittal of RWPs to ensure sufficient time to perform ALARA reviews is provided.

The licensee established a Radiation Protection/ALARA Work Request Traveler (Memo No. 31) on January 17, 1990. This is not a formal procedure but rather a memorandum of understanding as to how the radiation protection and maintenance groups will work together on processing a work request. A maintenance work analyst fills out the section and routes it to the ALARA personnel. While there are no mechanisms to ensure the ALARA personnel obtain a work traveler in sufficient time to perform an ALARA review commensurate with the degree of expected exposure, inspector discussions with ALARA personnel indicated timeliness has not been a problem. The

Radiation Protection/ALARA Work Request Traveler does not provide for review of tasks on a sub-task basis. The work principally is reviewed from an aggregate exposure standpoint for the completed task. The licensee is currently developing a radiation work permit request which includes evaluation of sub-tasks from an ALARA perspective. This will provide for closer scrutiny of individual subtasks of a large work activity.

The ALARA personnel recommend insertion of ALARA flags into work packages. If the work analyst disagrees with the ALARA flag, then the ALARA personnel are notified. The work traveler is not required to be reviewed or commented on by the operations radiation protection group who issues the RWP. The ALARA review assigns or recommends certain ALARA actions based on total exposure.

The licensee has established administrative procedures that describe the preparation, revision, and review of station procedures. These procedures are in the LAP-820 series and include LAPs-820-6, 820-7, 820-9, and 820-10. The licensee's procedures do not require or provide for review of other department procedures from an ALARA standpoint (e.g., maintenance). The ALARA group, however does review special procedures for certain work activities (e.g., reactor reassemoly) that have significant radiological concerns. This is done during initial work planning.

In general, the RWP/ALARA procedures in conjunction with internal memoranda have provided an adequate framework for ensuring ALARA is factored into work activities. However, there are a number of areas in which the procedures can be upgraded to enhance the implementation of the ALARA program.

b. ALARA Input to Job Planning

Work planning is accomplished at outage planning meetings. Outage meetings start about six months before an outage. The ALARA personnel also attend system meetings where each system is discussed. Although the ALARA personnel normally receive RWP requests one month before an outage, attendance at these meetings give them advance knowledge of planned outage work.

The ALARA analyst attends the station modification meetings where all modifications are reviewed. Although meetings are held, there are no specific guidelines for holding pre-planning meetings for the purposes of discussing ALARA. Work supervisor input to the ALARA process for jobs less than three rem is not required.

Estimated man-hours for tasks are provided by the work analyst for the total job. The ALARA group evaluates the estimate based on previous history if available, if not the estimate is accepted as provided. The licensee's ALARA staff does not routinely solicit outside information on work history (e.g., man-hours including person-rem) for particular tasks done at other utilities. The licensee tracks daily accumulated man-hours and person-rem by use of "dose cards." The cards are filled out when any whole body exposure could be received.

The inspectors reviewed the adequacy of the licensee's estimates for man-hours and person-rem for the completed and active radiation work permit for the current outage on Unit 2. The review found that overall, the licensee's estimates (man-hours and person-rem) appeared to be adequate. The inspector estimated that the man-hours were over estimated in about 13% of the RWPs generated. A number of the over estimates were due to use of man-hour estimates from previous outages. Because of a change in scope of work or improvements in performance techniques, the licensee was able to complete the work in less time. For example, hydrolazing of the scram discharge header was able to be completed in 50% of the previous time. However, the inspector did note that a number of the man-hour estimates (particularly those associated with contractor labor support) were significantly over estimated. For example, the estimate being tracked by the ALARA group for set-up and tear down of the Unit 2 Drywell Bull Pen Area was estimated at about 2,200 man-hours. The licensee's ALARA personnel however projected that the work would be completed with 166 man-hours. A similar example involved labor support for Unit 2 reactor vessel disassembly and reassembly. The work was estimated at 1100 man-hours to complete. The licensee's ALARA personnel projected about 258 actual man-hours to complete the work.

The inspectors identified very few RWPs where the man-hours were underestimated. If man-hours were underestimated, this could result in underestimating the accumulated exposure; consequently, ALARA actions may not be taken where needed. The inspector concluded that overall, the licensee's estimate for man-hours and person-rem to complete a task appeared reasonable.

c. Procedure Implementation

The inspector's review of the ALARA controls outlined in the RWP procedure and the ALARA action requests indicate that these implementing procedures address basic elements of a program for performing pre-planning, ongoing job review, and post-job evaluation of radiological work activities. The inspectors review of RWPs at the Unit 2 Drywell Control Point indicated the permits were implemented in accordance with procedure requirements. ALARA checklists and action reviews were also completed as required. However, the following concerns were identified:

- The RWP ALARA checklist (Attachment F to Procedu
  No. LAP-100-22) provides the initial criteria use. .o evaluate work activities fro. an ALARA perspective. This checklist is completed by the radiological control technician preparing the RWP. The checklist:

  - focused on job specific ALARA requirements and did not ensure that repetitive jobs that would be performed over the life of the facility would be reviewed for potential dose savings;

  - did not contain all appropriate items to be considered for each level of exposure for dose reduction, including: movement of the work to lower dose rate areas; use of video cameras for monitoring work activities remotely, particularly for repetitive tasks; the need for mock-up training; the need for special procedures; or the use of other alternatives to meet the intent of the original task. The checklist considered a number of these items, but only for higher exposure values.

- The RWP ALARA checklist provides criteria to be used to evaluate the need to refer the work activities to the ALARA coordinator for review. Several of the criteria are subjective and do not provide sufficient guidance for properly assessing or ensuring that particular criterion are met. For example, one criterion addresses whether the job has "serious potential problems associated with it." It is unclear what a serious potential problem is. Another criterion asks if the exposure expenditure will be 1 person-rem. It is unclear whether this is job specific or over the life of the facility. In addition, one criterion is whether the air inside a respirator will be 25% of an MPC. It is unclear as to how this will be determined.

d. ALARA Job Reviews

The RWP and ALARA program procedures do not provide the methods or criteria to be used to perform ongoing job reviews of radiological work activities. The licensee is using an informal method to track ongoing work using the RWP system. The licensee looks at aggregate person-hours to complete a job and calculates an estimated aggregate exposure to complete the task. The licensee compares percent job completed against accrued exposure to determine if problems are being encountered.

The inspector met with ALARA representatives to determine the extent of ALARA reviews performed by the ALARA personnel for ongoing outage work. The licensee established an outage goal of 481.5 person-rem for the Unit 2 third refueling outage. The inspector's discussions with the ALARA representative indicated that 87% of ongoing outage exposure had received a formal ALARA review by the ALARA personnel. The remaining 13% had received an ALARA review performed by the radiation protection staff. The inspector

concluded that despite weaknesses in the RWP and ALARA program procedures, a substantial portion of the estimated aggregate exposure for ongoing outage work had received some level of ALARA review.

There was also no formalized post-job ALARA review criteria. The licensee has an informal criteria of one person-rem in excess of the original estimate or over five person-rem. Inspector discussions with ALARA personnel indicated that post-job reviews had been completed on only about 10% of all work (including outage work) for 1990.

e. ALARA Related Observations

The inspectors reviewed general ALARA practices during plant tours. The inspectors concluded that personnel appeared to be sensitive to the need to maintain their exposures ALARA. However, the following examples indicate instances where personnel were not as cognizant of the need to plan for or wait in lower dose rate areas as they should have been.

- Low dose wait areas are not posted throughout the Unit 2 Drywell. The inspector observed a firewatch on the 710' elevation of the Unit 2 Drywell on April 23, 1990, standing in a 30 mR/hr field performing the firewatch function. An unposted area, that exhibited a dose rate of about 7 mR/hr, was about five feet away. The firewatch could have performed his duty at that location.

- Inspectors observed five individuals sitting in the Unit 2 Control Rod Drive Disassembly and Rebuild Room. The workers, including the foreman, were sitting in a 5 mR/hr field for at least 20 minutes. The workers were directed to wait in this area by a radiation protection technician because the technician thought they were needed for an impending job. After the inspectors questioned the technician about the workers sitting in the area, the technician directed the workers to wait at the Unit 2 Drywell Control Point, which measured about 0.6 mR/hr.

- Because of concerns about potential loss of control of contaminated tools coming out of the Unit 2 Drywell, the licensee required workers to place their tools and equipment at the exit of the equipment hatch to be checked for contamination. Although radiation protection technicians are instructed to have workers waiting for a tool check stay in low background areas, one worker was observed waiting in a 5 mR/hr field. The worker could have moved to an area near the check-point and observed the tools and equipment while waiting in essentially a 0.6 mR/hr field.

- Inspectors observed personnel suiting up workers in bubble hoods and plastic suits to perform work activities in the Unit 2 Drywell on the 67 B valve. Inspectors also observed that one worker was resuited several times. Also, the workers were held-up while the dosimetry of one of the workers was re-positioned. These activities were performed in a radiation field ranging from 5-30 mR/hr.

The inspectors also reviewed the licensee's ALARA planning for the clean-up and repair of tanks and tank rooms (e.g., ultrasonic resin tank and waste sludge tanks) in the Unit 1 turbine building 603' elevation. The licensee was cleaning up the room as part of a bigger work activity to repair waste tanks. The inspector noted that personnel made an entry into the ultrasonic resin and waste sludge room on April 12, 1990. Workers were required to sift through dry residue, several inches deep, to search for debris that would hinder a robot which was to be used in the room. The dry residue exhibited general area dose rates measuring up to about 2 R/hr. Workers received about 400-500 mrem whole body dose for a 15-minute entry. The inspector noted that the licensee had not performed a detailed ALARA evaluation of the entire radwaste system repair operation to evaluate all ALARA options to decontaminate and cleanup the various room areas and tanks. The work had been planned from a mechanical point of view. The workers did not wear extremity dosimetry for the feet. The inspector noted that the dosimetry procedures did not require the use of extremity dosimetry but recommended its use if an extremity would receive 300 mrem and the extremity dose was twice the whole body dose. (A separate management meeting will be held regarding the radwaste contamination control and extremity exposure aspects of this matter.)

Based on the above review, this portion of the licensee's program is adequate. However, the following areas are recommended to strengthen the ALARA program.

- Improve overall quality, content and guidance contained in RWP and ALARA procedures to ensure jobs are reviewed on sub-task bases and all appropriate ALARA techniques are considered for exposure reduction. Eliminate the use of memoranda to control ALARA program activities.

- Sensitize workers and supervisors regarding the need to eliminate extraneous doses by waiting in low radiation areas.

- Formalize and upgrade the criteria for the ongoing job review and post-job evaluation process.

c. ALARA Initiatives/Operational Practices

The inspectors observed inplant ALARA initiative (D/W shielding), reviewed records/data, and discussed station dose reduction initiatives with licensee representatives. Engineering ALARA controls used for dose reduction include, but are not limited to shielding, chemical decontamination, flushing, and hydrolazing. Maintenance of good water chemistry, reduction of personnel involvement in high dose jobs and initiation of new programs to identify sources of dose are also being implemented successfully by the licensee.

The chemistry program was discussed with a licensee representative. Analytical results were examined and found to be within the EPRI guidelines. The representative stated that maintaining the best water chemistry possible is a factor in dose control and that no other programs currently available to BWR's (hydrogen water chemistry, zinc addition, etc.) have been implemented at the station. However, hydrogen water chemistry will be evaluated again in the future.

A Plan for Excellence to address cobalt reduction has been initiated by Corporate to establish a cohesive program encompassing efforts and studies to date and initiatives. The Plan will identify and prioritize methods and results in an action plan to reduce cobalt in reactor systems and provide a cost benefit analysis for the elements of the action plan. The licensee specifies low cobalt bearing materials for use in reactor and support system replacement.

Cost benefit analyses to evaluate person-rem savings associated with chemical decontamination of the recirculation system via the LOMI process have been made for past and the current outage (L2R03). While the benefits did not in all cases justify a chemical decontamination, it was performed as part of L1R02, L1R03 and L2R02, resulting in general area decontamination factors of 1.88 - 2.52. The chemical decontamination cost benefit evaluation for L2R03 concluded that the person-rem savings would be insufficient to justify decontamination for this outage.

Reactor cavity cleaners and other decontamination techniques such as glass bead blasters and high pressure hydrolazing of reactor recirculation pump bowls, cavity drains in the reactor cavity and dryer separator pits and other piping systems, reactor vessel nozzles and primary system valves have been used effectively. The use of a scavenger robot and strippable coating on the reactor cavity are being investigated.

Flushing of the ECCS before flood up to reduce dose and a final flush of the system to reduce iron remaining in the system due to a condenser open to the atmosphere was another example of effective decontamination implemented by the licensee. A CRD water tank is used during drive disassembly to provide both a decontamination medium and total body shielding.

A source term reduction program was initiated in July 1989 in an effort to reduce dose rates by initiatives such as shielding, system flush, and hydrolazing port installation. Approximately 50 hot spots/lines have been identified by survey results and a report with appropriate recommendations is being compiled. In one instance modification of fuel pool recirculation reduced local dose rates by a factor of two without cost. A leak reduction program recently introduced is projected to save approximately 10 person-rem in 1990.

Various remote (automated) equipment is used during outages to reduce the time of exposure and reduce the dose rates that contribute to exposure. Included are a faster, second generation control rod drive handling machine, multiple head tensioners, remote MSIV maintenance equipment, quick disconnect insulation, remote tools, and CRD cleaning and disassembly equipment. Two of the more significant contributors to person-rem reduction are the use of the GERIS technique to inspect vessel welds, and multiple head tensioners. The licensee's estimate of the GERIS system savings is 475 person-rem for the current outage. In addition to dose savings multiple tensioners reduce outage time and critical path time.

The licensee appears to be aggressively addressing dose reduction with respect to programs and equipment initiatives. Most effective have been chemical decontamination, increased shielding, hydrolazing and the use of GERIS for remote weld inspection. Efforts to identify dose reduction aspects indicate positive results for two new programs, leak reduction and hot spot/line source. Aggressive use of new and upgraded equipment has reduced dose and should aid in outage reduction and critical path adherence.

Based on the above review, this portion of the licensee's program is adequate.

9. Assessment/Self Evaluation

The licensee evaluates ALARA performance by conducting QA audits/ surveillances, post-job reviews, ALARA lessons-learned outage reports, and special assessments by external organizations. The inspectors selectively reviewed QA audit/surveillance reports of the ALARA program from 1988 to present. These reports appeared to result in an adequate self assessment of the ALARA program with a sufficient number of performance based observations. The inspector also selectively reviewed portions of a recent ALARA outage report and post-job reviews. Although it appeared desirable for the licensee to somewhat improve the quality of post-job reviews, the lessons-learned presented in the ALARA outage report appeared adequate to result in significant future dose-saving if appropriately implemented. According to the licensee, during 1987-1989 there were ten special external assessments of the ALARA program. A selected review of the assessment reports showed that most of these external appraisals identified areas of the licensee's ALARA program which needed significant improvement. Although the licensee proceeded to implement most of the suggested improvement items, it may be necessary to more aggressively pursue dose-saving recommendations as evidenced by continuing high radiation exposure.

By documentation reviews and interviews with licensee personnel, the inspectors assessed whether root cause analyses of maintenance rework and equipment history files of unreliable equipment were adequate to appropriately minimize personnel radiation exposure. It was noted that the licensee regularly obtains component failure comparison data from the Component Failure Analysis Report (CFAR) option of the Nuclear Plant Reliability Data System (NPRDS). This data appeared to be well utilized to increase component reliability and thus minimize radiation exposure by significantly reducing maintenance rework. However, since the CFAR data are only applicable to safety-related equipment and certain components important to safety, the licensee also needs an effective, but separate, method to minimize maintenance rework of Balance of Plant (BOP) equipment.

The licensee keeps track of BOP maintenance and equipment problems with the use of several systems, including Discrepancy Record Trending (DRT Procedure No. LTP-200-8), Total Job Management (TJM, Procedure No. LAP-1300-1 and No. LAP-300-11), and Problem Analysis Data Sheets (PADS, Maintenance Department Memorandum No. 27). DRT trends discrepancy root causes, including those for the mechanical, electrical, and instrument maintenance gauges. TJM delineates the administrative controls necessary to properly generate and process Work Requests (WRs), and specifies the use of the Computerized Maintenance History Program (CMHB). CMHB is used to issue Maximum Occurrence Reports (MORs) if a component fails three times within a 12-month period. Maintenance work analysts use the CMHB to generate equipment history records and MORs to aid in preparing ALARA Travelers as part of WR packages. The ALARA Traveler requires ALARA Planning input early in the development of the WR to factor lessons-learned into the planning process, and to identify measures such as shielding, ventilation, and other radiological controls that should be considered by the work analysts.

Although the BOP maintenance rework and equipment problem tracking and trending systems appeared to be well utilized by the licensee when developing individual WR packages, they have not been integrated together to formulate a broadscope effective method to minimize radiation exposure by significantly reducing BOP maintenance rework, such as has been accomplished for safety-related equipment by the NPRDS CFAR. The licensee recognizes this programmatic deficiency as a result of the NRC Maintenance Team Inspection conducted on May 1-25, 1989 (Inspection Reports No. 50-373/89010(DRS); No. 50-374/89010(DRS)). In response to inspection findings, the licensee has opened three internal items to track corrective actions to resolve the following identified concerns: (1) lack of comprehensive trending program for corrective maintenance, (2) trending program does not consider component significance, and (3) work request cause codes are not used for trending. The licensee indicated that little progress has been made to resolve these action items.

The inspectors discussed with a Senior Licensee Manager the above concern and the apparent desirability of integrating ALARA initiatives into maintenance trending programs. (The licensee presently does not formally factor anticipated radiation exposure into the component reliability program.) The Senior Manager indicated that the licensee's Task Force on the Conduct of Maintenance at Nuclear Power Stations would review the above concerns at a future meeting. The Task Force members include an assistant maintenance superintendent from each of the six licensee nuclear power stations and two licensee corporate senior managers. The inspectors discussed with the LaSalle County Station task force member additional details regarding the Task Force charter, governing Nuclear Operations Directive No. NOD-MA.2, and licensee speculation on when the aforementioned corrective action items would be completed and potential means of integrating ALARA initiatives into maintenance trending programs.

Based on the above review, this portion of the licensee's program is adequate. However, the following item is recommended to strengthen the ALARA program.

- Develop a comprehensive BOP maintenance rework and equipment problem tracking and trending system to minimize radiation exposure by increasing component reliability.

10. Exit Meeting

The scope and findings of the inspection were summarized on April 27, 1990, with those persons indicated in Section 1. The inspectors described the areas inspected, indicating that although the licensee had an adequate ALARA program, there was still room for considerable improvement in almost all areas of the program (see the Executive Summary, Enclosure 1 to the Cover Letter). The licensee acknowledged the inspection findings without exception. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspectors during the inspection.

ATTACHMENT 1

Occupational Dose Comparison
for
LaSalle Nuclear Generating Station
versus
Average U.S. Boiling Water Reactors (BWRs)

Collective Dose Per Reactor (Person-Rem/Year) (NUREG/CR-0761)

	1986	1987	1988	1989
LaSalle 1, 2	475	697	1236	692
Average BWR	652	513	529	*
% of Average	-27%	+36%	+134%	*
Rank (Highest)	11th out of 30	5th out of 33	2nd out of 34	*

* Data Unavailable

Annual Individual Dose (mrem/year) (NUREG/CR-0761)

	1986	1987	1988	1989
LaSalle 1,2	590	800	900	560
Average BWR	420	400	450	*
% of Average	+40%	+100%	+100%	*

* Data Unavailable

Daily Collective Dose per Reactor (mrem/day) (Hinson, NRC, 1990)

	Non-Outage Dose Rate	Outage Dose Rate
LaSalle 1,2 (1986-1988)	750	5000
Average BWR	441	4000
% of Average	+70%	+25%

Attachment 2

Comparison of BWR Radiation Levels During Shutdown from Available Literature on Selected Components and Systems versus LaSalle Exposure Rates

(Hattan, et. al., Nuclear Technology, Vol 68, June 1985)

Location	Type of Measurement	NUREG/CR-0672 Dose Rate (mR/h)	EPRI-404-2 Dose Rate (mR/h)	SWEC Program Dose Rate (mR/h)	LaSalle 1 3rd Outage Nov 1989 (mR/h)	LaSalle 2 3rd Outage April 1990 (mR/h)
Low pressure core spray piping	Contact	10 to 180		80 to 400	3 to 6	5 to 10
RHR system						
Pump	Contact	15 to 27		80 to 400	-	10 to 45
Pump piping	Contact	35 to 55		200 to 1200	250	10 to 150
Pump	General Area	20 to 50		1[illegible] to 50	5 to 30	10 to 200
RCIC system						
Pump	Contact	2 to 8		60 to 90	2 to 3	2 to 5
Pump piping	Contact	50 to 60		150 to 1000	-	-
Pump	General Area	5 to 10		5 to 60	2 to 3	2 to 5
Control-rod drive system						
Pump filter	Contact	80		200 to 800	50 to 500	300 to 1500
Pump	Contact	1 to 2		10 to 480	1 to 5	3 to 15
Pump	General Area	10		8 to 150	1 to 5	3 to 15
Pump piping	Contact	15		10 to 1900	10 to 30	5 to 45
Reactor water recirculation pump	Contact	100 to 370	55 to 300	15 to 300	50	50
Piping at bottom of pump	Contact	35 to 60		90 to 300	50 to 120	110
Return piping to reactor	Contact	60 to 90		300 to 900	25 to 180	100 to 600
Steam relief valve from main steam line (in drywell)	Contact	40 to 43		2 to 100	5 to 10	5 to 10
Main steam system						
Piping	Contact	35 to 70		10 to 300	1 to 5	1 to 5
Valves	Contact	5 to 40		2 to 450	5 to 40	5 to 40
TIP drive mechanisms	Contact	15		100 to 800	< 5	< 5
Reactor building equipment drain sump	Contact	5		100 to 600	3 to 50	3 to 50
TIP room	General Area	30 to 50		20 to 60	15	10 to 35
TIP probe shields in TIP room	Contact	50 to 200		600 to 2500		350 to 1800
Control-rod drive modules	Contact	2 to 45		2 to 100	2 to 5	2 to 5
RWCU system						
Pumps	Contact	100 to 1200	350 to 7000	40 to 4000	25 to 110	50 to 130
Piping	Contact	70 to 220	250 to 10000	200 to 8000	800 to 2500	150 to 2300
Drain	Contact	160 to 210		700 to 1500		170 to 1700
Heat exchanger	Contact	300 to 10000	600 to 900	50 to 5000	300 to 500	200 to 350
Heat exchanger	General Area	20 to 750		10 to 600	200 to 500	200 to 350
RHR system						
Heat exchanger	Contact	50 to 250	60 to 8000	100 to 2500	50 to 130	100 to 200
Heat exchanger piping	Contact	800	100 to 1500	250 to 1500	100 to 250	100 to 300
Heat exchanger	General Area	160 to 600	10 to 500	10 to 500	30 to 90	70 to 110
Fuel pool cooling equipment	General Area	100		50 to 1600	20 to 160	80 to 260
Standby gas filter unit	General Area	25		1 to 4	< 1	< 1

Attachment 3

Repetitive High Dose Jobs During Refuel Outages (NUREG/CR-4254, May 1985)

LaSalle versus General Electric BWRs
Collective Dose Summaries for Outage High Dose Jobs

Job Title	Collective Dose (person-rem) Min	Max	Avg	Population Size	LaSalle 2 1st Outage 01/03/87 -05/30/87 (person-rem)	LaSalle 1 2nd Outage 03/13/88 -07/08/88 (person-rem)	LaSalle 2 2nd Outage 10/15/88 -02/10/89 (person-rem)	LaSalle 1 3rd Outage CB/15/88 -01/10/90 (person-rem)
Snubber Inspection & Repair	2.6	1400	290	15	157.6	251.6	135.7	6.7
In-Service Inspection	32	380	150	15	27.3	14.0	11.2	105.1
CRD Removal/Rebuild & Replacement	6.3	230	60	15	64.2	62.0	59.9	51.9
Scaffold Installation/Removal	24	120	57	3	23.8	60.5	91.9	30.3
Insulation Removal/Replacement	0.6	170	44	8	44.2	55.0	77.2	20.5
Safety Valve Repair & Inspection	9.3	80	39	14	81.5	30.0	39.5	34.6
RHR System Repair & Maintenance	11	48	34	5	22.6	36.6	37.5	21.5
Reactor Disassembly/Assembly	7.8	51	24	15	16.9	24.5	25.3	39.0
MSIV Repair & Inspection	2.7	67	20	13	3.2	3.1	5.6	3.3
Fuel Shuffle/Sipping & Inspection	3.8	58	19	15	1.6	-	-	1.9
Instrumentation Repair & Calibration	3.2	41	15	4	10.8	7.2	13.1	37.0
TIP/SRM/IRM or PRM Calibration, Repair & Maintenance	3.5	41	11	14	11.9	14.4	19.2	28.0
Recirculation Pump Seal Replacement	1.5	23	7.8	11	0.5	1.9	5.0	3.1
Turbine Overhaul & Repair	0.2	21	6.2	14	0.3	0.3	0.4	2.3

Repetitive High Dose Jobs During Routine Operations & Outages (NUREG/CR-4254, May 1985)

LaSalle versus General Electric BWRs
Collective Dose Summaries for Routine Operations & Outage High Dose Jobs

Job Title	Collective Dose (person-rem) Min	Max	Avg	Population Size	Operations & Outage 1987 (person-rem)	Operations & Outage 1988 (person-rem)	Operations & Outage 1989 (person-rem)
Primary Valve Maintenance & Repair	7	150	57	6	169.6	165.3	71.7
Plant Decontamination	9.4	65	37	12	102.1	125.9	36.8
Operations - Surveillance, Routines & Valve Lineups	11	53	24	9	20.9	44.9	56.4
Radwaste Systems Repair, Operation & Maintenance	7.7	28	16	4	49.9	70.1	53.1

ATTACHMENT 4

Commonwealth Edison Company's
LaSalle Nuclear Generating Station
Collective Radiation Exposures for
Non-Repetitive High Dose Jobs

1987

(Hinson, 1989)

LaSalle 1, 2 (1,394 rems)

- Recirculation pump mainterance (197 rem)
- Snubber reduction, testing, removal (126 rem)
- Drywell cooling installation (123 rem)
- Mechanical stress improvement program (10 year) (63 rem)
- Drywell cleanup and decontamination (63 rem)

Total: 572 person-rem

1988

(Hinson, 1989)

LaSalle 1, 2 (2471 rems)

- Install and remove scaffolding and gratings (142 rem)
- Snubber reduction, testing, removal (135 rem)
- Drywell cooling installation - Unit 1 (125 rem)
- Remove mechanical snubbers and support steel in drywell (122 rem)
- Drywell decontamination/fire watch (115 rem)
- Mechanical stress improvement program (95 rem)
- Drywell cooling installation - Unit 2 (94 rem)
- Remove interferences for Unit 2 reactor recirculation pump (66 rem)
- Remove and install Unit 2 drywell insulation (50 rem)
- Install reactor vessel level instrumentation system (60 rem)
- Inspect/repair reactor recirculation pumps (142 rem)

Total: 1146 person-rem

1989

(LaSalle County Station Radiation Protection Outage Report for L1R03)

LaSalle 1, 2 (1380 rems)

- Drywell cooling modification (L2) (32 rem)
- Remove/rebuild/replace 20 CRD (67 rem)
- In service inspector (92 rem)
- Drywell cooling installation (L1) (160 rem)
- Snubbers (8 rem)
- SRV (13 rem)
- 67 A/B receive discharge valve repair (34 rem)
- Decontamination (34 rem)
- Shielding (27 rem)

Total: 467 person-rem

ATTACHMENT 5

Dose Reduction Techniques for Repetitive High-Dose Jobs Conducted During Routine Operations and Outages

Primary Valve Maintenance and Repair

Dose Rate Reduction Techniques:

- Hydrolase local piping and valve internals
- Flush local pipes and valves if practical
- Remove valve or operator to a low-dose-rate area
- Evaluate need for local shielding
- Establish low-dose-rate waiting areas
- Provide beta protection if required
- Use mobile shield rack
- Design and fabricate custom shielding package for unshielded valves

Timesaving Techniques:

- Place description of all valve locations and/or pictures of valve location on door of cubicle
- Use specialized tools to remove and replace packing and valve seat
- Provide mockup training on valve repair if practical
- Provide lighting and scaffolding if necessary
- Use photographs and drawings of valves to familiarize workers
- Prefabricated packing of parts
- Use of ribbon packing or line load packing
- Remove interferences

Contamination-Reduction Techniques:

- Utilize glove bags or catch pans
- Provide local ventilation if practical
- Place plastic or blotter paper under valve
- Decontaminate area under valve periodically
- Contain packing material and valve internal following removal
- Moisten valve internals
- Install diaphragm inside valve body
- Thoroughly vacuum valve internals prior to reassembly
- Bead blast valve internals

Operations-Surveillance, Routines, and Valve Lineups

Dose-Rate-Reduction Techniques:

- Use reach rods and "T" handles for high-dose-rate area valves
- Assure continuous dose-rate monitoring (digital electronic dosimeters) in high-radiation areas
- Schedule rounds or surveillance when operating conditions yield the lowest dose rate
- Assure that hot spots and low-dose-rate areas are all posted
- Move step-off pads close to the operator observation point
- Locate instrument readouts in a low-dose-rate area
- Use water windows, TV, and mirrors
- Flush instrument periodically
- Reduce surveillance frequency in high-radiation areas if possible

Timesaving Techniques:

- Attach pictures or drawings of valve locations onto cubicle doors
- Provide floor and wall markers pointing at valve locations
- Use highly visible easy-to-read valve tags
- Provide valve checklist with written description of valve locations
- Use colored ribbon to identify faulty equipment
- Use lead shielded barrel carts

Plant Decontamination

Dose-Rate-Reduction Techniques:

- Use lead shielding on fork lift and drum carrier
- Measure dose rates on all waste bags, drums, and bins prior to transport
- Use remote control cleaning equipment e.g., robotic hydrolaser
- Segregate waste by radiation level

Timesaving Techniques:

- Employ dedicated decontamination technicians
- Use carts to move laundry and dry active waste
- Use floor-scrubber and wall-washing machines
- Use steam-cleaning machines
- Use air-operated vacuum cleaners
- Use high pressure freon, glass bead, electropolishing and ultrasonic cleaning equipment
- Provide judicious planning of areas to be deconned
- Use the most appropriate decon technique
- Test all mechanical and electrical equipment before use

Contamination-Reduction Techniques:

- Repair leaks immediately upon discovery
- Use mop bucket plastic liners
- Use dry cleaners to reduce liquid radwaste handling
- Use strippable decontamination coating

Radwaste System Repair, Operation, and Maintenance

Dose-Rate-Reduction Techniques:

- Use drum survey shield
- Evacuate areas along resin piping during resin transfers
- Flush lines and shield prior to insulation, heat trace, or repair
- Use overhead crane, fork truck, and remote handling tools
- Use reach rods on high-dose-rate valves
- Supply mobile solidification system
- Provide remote control automated drumming facility
- Install lead housing over resin transfer pump
- Use rope pulley and snap hook to remotely move filters and place in drum
- Survey filters and demineralizer beds remotely through holes bored in walls
- Use mobile shield racks
- Provide remote waste-sampling points

Timesaving Techniques:

- Modify filter cartridge housings to facilitate opening and filter removal
- Replace unreliable motors, pump, and valves with those which are more reliable
- Employ dedicated radwaste operators and handlers

Contamination-Reduction Techniques:

- Decontaminate floor and equipment routinely
- Provide remote drum decon station
- Use strippable paint in drum and waste processing area

ATTACHMENT 6

Annual Dose Goals vs Actual for the LaSalle County Station

Dose (Rems)

Year	(Initial Goal)	(Revised Goal)	(Actual)
1987	900	1149	1394
1988	1100	2000	2469
1989	1400	1400	1386
1990	875		

ALARA TEAM INSPECTION GUIDANCE

1. Background

   1.1 Review dose history, including significant high dose jobs.

   1.2 Review ALARA program history.

   1.3 Compare exposure for major jobs with the national average.

2. ALARA Program/Organization

   2.1 Verify that an adequate written management policy, statement has been issued to cover the ALARA program.

   2.2 Through interviews and inspector assessment, determine management and worker participation and knowledge of the ALARA program.

   2.3 Is management committed towards ALARA as demonstrated by its allocation of manpower and resources, along with verbal and written endorsements to this commitment?

   2.4 Is there an ALARA suggestion/incentive program? If yes, is it effectively used?

   2.5. Is ALARA considered in employee/management performance appraisals?

   2.6 Determine whether the following positions exist, and whether the assigned personnel are qualified for the positions:

      2.6.1 Full time ALARA Coordinator.
      2.6.2 ALARA Committee.

   2.7 Verify that responsibilities for conducting the ALARA program have been assigned to the following positions:

      2.7.1 Corporate ALARA organization.
      2.7.2 Plant Manager.
      2.7.3 ALARA Coordinator.
      2.7.4 ALARA Committee.
      2.7.5 Radiation Protection Manager
      2.7.6 Health Physics Department.
      2.7.7 Design Engineering.
      2.7.8 Outage Coordinator.
      2.7.9 Individual workers.
      2.7.10 Maintenance Department.

3. Corporate Involvement

   3.1 Is Corporate support for ALARA aggressive and effective?
   3.2 To what degree and under whose direction does the licensee integrate Corporate initiatives into the plant's ALARA program?

3.3. What is the plant's assessment of the Corporate ALARA group?

3.4 What is the Corporate's assessment of the plant ALARA group?

3.5 Does the utility participate in industry study groups for source term reduction techniques?

3.6 Has corporate established a system for identifying, evaluating and prioritizing dose reduction items?

3.7 What is Corporates role in establishing station dose goals (currently and historically)? If their role has changed, what was the basis for the change?

3.8 Does a long range plant exist for budgeting major items?

4. Training

4.1 Verify that adequate ALARA training is provided for:

4.1.1 General Employee Training.
4.1.2 Radiation workers.
4.1.3 Radiation Protection Technicians.
4.1.4 Corporate personnel.
4.1.5 Special maintenance teams.
4.1.6 Mockup training and facilities.

4.2 Does the ALARA Coordinator participate in professional development activities, such as Westinghouse's REM Seminar or EPRI workshops?

4.3 Determine quality of ALARA training program: instructors, facilities, materials.

4.4 Assesses the interface between operations, maintenance, radiation protection and training.

4.4.1 Is operations staff trained in ALARA to become sensitive to the needs of maintenance and health physics?

4.4.2 Does operations, maintenance and radiation protection provide feedback to training department on what is/is not working?

4.5 Determine if RWP training addresses ALARA.

5. Management Goals

5.1 Review the licensee's management goals (past and present). How are these goals established?
5.2 Does the ALARA program include man-rem goals and objectives for annual totals of individuals and maintenance jobs?

5.3 Are there department man-rem goals established and periodically reviewed?

5.4 Does the licensee's ALARA program achieve it's goals and objectives?

6. ALARA/RWP Procedure Implementation

6.1 Assess mechanics of ALARA reviews: pre and post job review criteria; enforcement of ALARA controls and RWP requirements; input from job supervisor; method by which ALARA controls and RWP requirements are relayed to workers; how actual dose for job is tracked, team size determination.

6.2 Are ALARA Coordinators in the field? Are RWPs reviewed? Check the method for estimating the number of man-hours per job. What are the trigger levels for ALARA review and are they effective?

6.3 How are plant procedures reviewed? Is ALARA adequately integrated into the procedures and the review process?

7. Planning/Scheduling

7.1 Do departments have ALARA coordinators/representatives, or work planning organization with ALARA involvement? What are their functions?

7.2 Review the ALARA Committee: function and charter, attendance records, organizational structure (how many?, who's in charge), meeting frequency, final product of meetings, accomplishments, meeting minutes

7.3 Verify that the ALARA organization is allowed sufficient lead time to review proposed design changes, modifications, and maintenance work.

7.4 Verify that an ALARA package is initiated and processed for individual jobs.

7.5 Verify that an ALARA checklist/evaluation with job specific ALARA recommendations, as appropriate, is part of each ALARA package.

7.6 Does the ALARA program provide for the continual dose tracking of ongoing jobs to identify whether ALARA projections may be exceeded? Is there a provision to update or modify dose projections as the work progresses?

7.7 Verify that the ALARA program has adequate programs for modifying or terminating jobs that deviate from the original objectives.

7.8 How are tools staged, shielding installed, and decon performed?

7.9 Are mockup training or videotapes provided for high dose jobs that are unique, repetitive or time consuming?

7.10 Does ALARA job planning include equipment setup time?

7.11 Do planners walk down jobs? What is their input to ALARA reviews (scaffolding, lighting, scheduling, tools, etc.)?

7.12 Are job history files maintained and used?

7.13 Is a video-library or photo-library of plant areas, components, and equipment setup used for pre-job briefings?

7.14 Is a minimum man-rem limit established for requiring a formal ALARA review? (See Section 6.2)

7.15 Verify that adequate action levels have been established for each job such as: less than 1 man-rem only requires RWP; greater than 5 man-rem to less than 20 man-rem requires ALARA Coordinator approval; and greater than 20 man-rem requires ALARA Committee approval. Other triggers could be: work in high rad areas greater than 5 minutes; work in 5 MPC; work in highly smearable area (1 Rad/100 cm^2).

7.16 What is the content/protocol for pre-job meetings?

7.16.1 Are they initiated on a minimum dose man-rem estimate?

7.16.2 Do meetings include all jobs assigned workers and coverage technicians?

7.16.3 Are records kept of meetings

7.16.4 Are lessons learned from previous meetings discussed?

7.17 Does the licensee use designated and experienced crews for decon, installation and removal of scaffolding, tents, temporary shielding, and portable HEPA units; and other high dose jobs such as ISI, steam generator work (jumping, sludge lancing, bolt or stud hole repair, CRD in-vessel, SRM/IRM/LPRM/TIPs) and diving.

7.18 Determine whether the ALARA program provides for discussions of work conditions and ALARA experience with other utilities that have participated in similar outages/maintenance. If so, at what level are the issues discussed?

7.19 Are excessive numbers of unplanned work items added to the schedule that don't allow for adequate planning?

8. ALARA Initiatives/Operational Practices

8.1 Are industry identified methods of reducing source term and innovative methods and techniques planned/implemented?
Have the Environmental T/S's addressed these methods/techniques?

8.2 Determine whether a routine (e.g., weekly) program exists to physically inspect high radiation and very high radiation areas to verify proper controls.

8.3 Is preventative maintenance being formed, and if so, is the frequency of the maintenance adequate? Are they being performed at the most dose effective time?

8.4 Does the licensee have a leak reduction program?

8.5 Is the licensee replacing high cobalt components such as: feedwater regulator valves (BWR's), CVCS flow controllers (PWR's) components of other valves and pumps, control blades, fuel channels, incore instruments, CRDM bearings (BWR's), and steam generator tubes and fuel grids (PWR's)?

8.6 Dose the licensee use strippable coatings, steam cleaners, hydrolazing grit blasting, dry ice blastings, rotating hones (brushes with nylon bristles tripped with silicon carbide), rotating steel brushes and cylindrical core devices (pigs) with silicon carbide or wire bristles, and floor scabblers?

8.7 Are video cameras and communications equipment used for job coverage and/or surveillances in high radiation or high contamination areas?

8.8. Are robotics and remote tools used for high dose surveillance, survey, decon, cleaning, cutting, transporting, and manipulating jobs? For example, are robots used for eddy current testing and sludge lancing in steam generators, diving, and ISI (PWR's)?

8.9 Is a high-powered pump used for sump cleaning?

8.10 Are automatic, multi-stud tensioners and cleaners used for the reactor head and manways?

8.11 Are steam generator manway shield plugs/manway doors used (PWR's)?

8.12 Are automatic manway removers, such as hydraulic lift tables used (PWR's)?

8.13 Are control rod drive handling machines used?

8.14 Are control rod drive flange shields used?

8.15 Is an ultrasonic tank (or electropolishing) used for cleaning control rod drivers?

8.16 Is hydrolazing of control rod drive scram discharge header performed? Are permanent hydrolazing ports installed?

8.17 Are in-pool temporary filtering systems used? If so, are they of an acceptable type?

8.18 Is the smallest mesh size practicable used for filters in the coolant filtering systems, including the letdown lines reactor coolant pump seals?

8.19 Is a reactor head shield used (PWR)?

8.20 Do maintenance procedures contain steps to ensure that debris from maintenance, such as cobalt-bearing debris from valve flapping, are cleaned out of the system before the system is closed?

8.21 Are component layup procedures used during outages?

8.22 Is electropolishing performed of new steam generator channel heads or replacement recirc pipes, possibly followed by prefilming?

8.23 Are communications headsets used?

8.24 Are automatic packing machines used?

8.25 Are automatic welders, weld prepping and pipe cutting machines, valve seat refinishers or other similar techniques employed?

8.26 Chemistry controls.

8.26.1 Is chemical decon performed?

8.26.2 Is hydrogen peroxide addition performed in PWR's prior to shutdown to induce crud burst?

8.26.3 Is oxygen concentration maintained at 200-400 ppb during hot functional tests in BWR's before power ascension to allow a protective film to form on piping surfaces?

8.26.4 Are BWR Chemistry Guidelines followed as detailed in EPRI document NP-3589-SR-LD?

8.26.5 Is water conductivity maintained below 0.2 microS/cm in BWR's during operation?

8.26.6 Is zinc injection (and Hydrogen Water Chemistry with or without zinc injection) performed in BWR's?

8.26.7 Is extended hot functional testing performed in good quality water to prefilm steam generator tubes?

8.26.8 Does the licensee avoid sudden drops in pH; maintain pH constant at 6.9; or possibly raise the pH to 7.4? Is a coordinated Li/B Chemistry Program implemented? (PWR's)

8.26.9 Is an overpressure of hydrogen (typically 25-30 cc/kg) maintained in PWR primary coolant to keep oxygen below 5 ppb?

8.26.10 Review the adequacy of the H_2 addition program versus high total body doses.

8.27 Does a program or approach exist to determine if a design change or if a modification that reduces dose is cost beneficial?

8.28 Do design engineers or radiological engineers review designs at the conceptual phase to ensure that provisions have been included that will reduce dose and the spread of radioactivity?

8.29 Does documentation exist to demonstrate that ALARA design reviews were performed?

8.30 Does the licensee have specific radiological design criteria which must be met by all designs?

8.31 Do the licensee's 10 CFR 50.59 modification program consider ALARA in their safety reviews?

8.32 How is the licensee addressing: source term reduction efforts; environmental T/S involvement to reduce stellite material (e.g., CRDM's, check valve seats); long term plant modifications to clean up source term?

9. Assessment/Self Evaluations

9.1 How does the licensee evaluate ALARA performance?

9.2 Review and determine the effectiveness of actions taken on internal and contractor audits and assessments.

9.3 Are internal audits substantive? How effective is the audit system? What is the frequency of the audits?

9.4 Are the qualifications of the personnel performing the audits of the ALARA program adequate?

9.5 Are post-job critiques conducted?

9.5.1 Is there a minimum man-rem total that needs to be exceeded to initiate a post-job review?

9.5.2 Do critiques include all workers and technicians?

9.5.3 Are records kept of meetings?

9.6 Are annual or outage ALARA reports compiled and distributed? What use is made of them?

9.7 Verify that the ALARA program provides for continued review and corrective action for chronic plant radiation problem areas (e.g., hot spots, contaminated drains and pipes in personnel access areas, unnecessary entries into high radiation areas, etc.). Does any

action plan provide for the involvement of system engineers to assist in proposing modifications for those systems with chronic problems?

9.8 Are maintenance reworks reviewed to determine root cause: personnel error during repair, wrong parts, inaccurate diagrams, etc.?

9.9 Are equipment history files reviewed to identify unreliable equipment? Are corrective actions taken to replace this equipment with more reliable equipment?

9.10 What percent of jobs had to be reworked because of personnel error, wrong parts, etc.?

10. Summary

ALARA TEAM INSPECTION

SUMMARY GUIDANCE

In the conduction of the inspection the big-picture results that we are trying to achieve should be kept in mind. To assist each inspector in focusing their efforts, think in terms of addressing the following questions in a summary section to each of the main inspection areas. It is acknowledged that many of these questions are unanswerable based on one or two inspections, but if the information is available and can be discussed with an eye towards coupling it with the results of future inspections, than we should try to do so.

1. Background

   Has dose history improved, declined or stayed about the same?
   Have any changes been obviously attributable to major programatic changes in the ALARA program?

   Why were the high dose jobs so high? Was there any aspects of the jobs that stood out as a major contributor to the high dose, or was it the result of numerous factors?

   How does this licensee compare to the industry?

2. ALARA Program/Organization

   Is management clearly supportive of maintaining and improving their ALARA program?

   Does the overall level of knowledge, attitude and understanding of ALARA by licensee personnel (staff and management) have a noticeable impact on the overall implementation of the program?

   Are the defined ALARA program positions (e.g., Coordinator) truly useful positions, with adequate levels of authority, or are some more of a token job with an inadequate amount of input into task decisionmaking.

   Does the ALARA suggestion program appear to work? If yes or no, is there an apparent feature that either make it work well or keep it from being effective?

3. Corporate Involvement

   Is Corporate involvement in ALARA a help or a hindrance to the plant? Where can they improve and what are they doing that appears to be beneficial?

4. Training

   Are personnel being adequately trained in ALARA? Are the right people being trained and is the training sufficient in scope and depth? Is it a

good or poor training program? Are the instructors capable and well qualified? What are the program weaknesses, if any?

5. Management Goals

Are the goals established reasonable? Is there a sound basis for the goals that are established, or are they "politically" motivated? Does having goals help the program achieve lower doses?

6. ALARA/RWP Procedure Implementation

Are the procedures adequate in scope and depth to enable the ALARA program to function without being either burdensome or overlooked?

Do they adequately implement the ALARA program? What are the program strengths and what are the weaknesses that need to be improved?

Did staff appear to be adequately incorporating good ALARA practices into their work assignments, or did they appear to do only do the minimum necessary to get by?

7. Planning /Scheduling

Are the projected doses for jobs reasonable? Or do they tend to be habitually over or under the estimate doses? If so, can we ascertain why?

Is job planning adequate in lead time and depth to allow for adequate implementation of the ALARA program?

Do they adequately implement the ALARA program? What are the program strengths and what are the weaknesses that need to be improved?

8. ALARA Initiatives/Operational Practices

Is the licensee aggressive in trying to implement new operational methods and practices in the pursuit of maintaining doses ALARA?

Do they adequately implement their operational initiatives and practices to obtain the maximum benefit from them, or are they poorly and/or slowly carried out?

9. Assessment/Self Evaluations

Is the licensee learning from previous experiences and adequately incorporating lessons learned into future work?
Has the licensee been good at identifying weaknesses in their program, or do they appear to be making the same mistake?

What is the cause of significant overexposure at the plant?

Is there a common root cause for significant overexposures?

10. Summary

Does their ALARA program overall appear to be effective? Are there particular portions of the program that stand out as particularly good or particularly poor? What should the licensee continue to do, and where do they need to improve?