



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
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ARLINGTON, TEXAS 76011-8064**

May 4, 2001

EA-00-208

Garry L. Randolph, Senior Vice  
President and Chief Nuclear Officer  
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P.O. Box 620  
Fulton, Missouri 65251

**SUBJECT: NRC REVIEW OF BACKFIT ISSUES, VIOLATION DENIAL, OCCUPATIONAL RADIATION SAFETY SIGNIFICANCE DETERMINATION PROCESS, AND FINAL SIGNIFICANCE DETERMINATION PROCESS APPEAL (NRC INSPECTION REPORT 50-483/00-17)**

Dear Mr. Randolph:

On October 4, 2000, the NRC issued Inspection Report 50-483/00-17, which documented three apparent White findings and an apparent violation of 10 CFR 20.1101(b) involving performance deficiencies in your program to maintain radiation doses as low as is reasonably achievable (ALARA). The performance issues were associated with six jobs conducted during Refueling Outage 10. On November 9, 2000, you presented your perspective on the apparent White findings and apparent violation at a regulatory conference conducted in the NRC's Region IV office. On January 9, 2001, the NRC issued its final significance determination for three White findings and a Notice of Violation (NOV). Following the issuance of the final significance determination and NOV, you submitted responses to both the three White findings and the NOV on February 7 and 15, 2001, respectively, which raised a number of concerns. On February 28, 2001, we notified you that we would be reviewing your concerns.

Consistent with our February 28, 2001, letter, the NRC has completed its review of the concerns raised in your letters dated February 7 and 15, 2001. Specifically, we reviewed your:

- Assertion that NRC imposed a regulatory staff position that is new or different from a previously applicable staff position,
- Denial of the 10 CFR 20.1101(b) violation identified in NRC Inspection Report 50-483/2000-17, and cited in the NOV,
- Assertion that the ALARA portion of the Occupational Radiation Safety Significance Determination Process (SDP) creates a new regulatory burden, is not objective, scrutable, and risk-based, and should be suspended, and

- Appeal of the NRC staff's final significance determination of the three White findings described in NRC Inspection Report 50-483/2000-17.

After careful consideration of your appeals, the NRC has concluded that: (1) the NRC did not impose a regulatory staff position that is new or different from a previously applicable staff position relative to the application of the SDP or assessing the violation of 10 CFR 20.1101(b), (2) the violation occurred as stated in the NOV, (3) the Occupational Radiation Safety SDP is not "fatally flawed" as you have asserted; therefore, it remains suitable for continued use, and (4) there were no significant discrepancies in the Region IV staff's application of the Occupational Radiation Safety SDP for the three White findings. The bases for these conclusions are described in Enclosures 1-4, respectively.

Regarding the backfit analysis, we determined that neither the SDP nor the NOV represents a backfit. The NRC's significance determinations are completely separate from determinations of licensee violations of NRC requirements. The SDP determination did not change, alter or modify the NRC's requirements for implementation of an ALARA program. The Occupational Radiation Safety SDP is an internal NRC tool designed to aid the staff in consistently determining the safety significance of inspection findings. The NRC believes that SDP determinations were not intended by the Commission to be within the scope of regulatory actions for which the Backfit Rule was adopted. Further, the NOV was not based on dose assessment accuracy. The NOV was based upon the fact that part of the dose in excess of the estimated dose resulting from specific jobs could have been avoided if you had properly designed and implemented appropriate work procedures and engineering controls based upon sound radiation protection principles, including sufficient ALARA planning and controls. Refer to Enclosure 1.

Regarding your denial of the violation, we have sustained our original conclusion that the violation occurred as stated in the NOV. While we acknowledge that your work scheduling may be consistent with industry practice, we have concluded that your ALARA planning and controls were not commensurate with the radiological working conditions associated with your specific work schedule. If the ALARA planning and controls had been commensurate with the increased challenges, the actual job doses would not have been excessive, even after allowing for the axial offset anomaly. Refer to Enclosure 2.

Regarding the Occupational Radiation Safety SDP, we have concluded that the SDP is fundamentally sound, even though there are areas that could be enhanced. We concluded that the SDP contains the necessary attributes to assess ALARA findings. For example, it contains programmatic elements that increase in significance for multiple/repeated program problems, and it recognizes greater significance, based on the magnitude of the dose. Moreover, experience during the first nine months indicates that, using the current SDP, we have not overreacted to ALARA findings in that only two plants have received greater than Green findings in the ALARA area. Refer to Enclosure 3.

Finally, regarding the SDP Appeal Panel's results, the Panel has determined that there were no significant discrepancies in the staff's application of the Occupational Radiation Safety SDP. The Panel has determined that the staff's decision to define "job" as the lowest level at which ALARA planning and controls take place, and the staff's decision to apply the definition at the Radiation Work Permit level were reasonable decisions based on the available facts.

Nonetheless, the Panel recommended that the staff provide you with additional information in support of that decision. This additional information is described in Enclosure 4 to this letter.

Please note that the last paragraph of Enclosure 1 states that the NRC will consider whether additional guidance should be provided to the staff to segregate SDP discussions in a discrete, separately subtitled section or paragraph of applicable correspondence/inspection reports devoted solely to SDP significance determinations. If you wish the NRC to apprise you of our final determination regarding this additional guidance, please notify us.

Similarly, please note that Enclosure 4, Part C, Item 3 requests that you provide additional written information to address a recommendation made by the SDP Appeal Panel. Your written response is requested to determine if this is new information that was not previously considered by the staff in reaching its decision. Please provide the requested response within 30 days of the date of this letter. Although this information may not change the outcome, it is requested so that the matter is accurately captured on the docket. If you wish, you may use this response to communicate your desire to have feedback regarding the additional guidance discussed in Enclosure 1.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/NRC/ADAMS/index.html> (the Public Electronic Reading Room).

Sincerely,

**/RA/**

Ellis W. Merschoff  
Regional Administrator

Docket: 50-483  
License: NPF-30

Enclosures:

1. Backfit Analysis
2. Response to Licensee's Denial of Violation
3. Response to ALARA SDP Fatal Flaw Issues
4. Part A - Summary - Significance Determination Process Appeal Results  
Part B - Conclusions and Recommendations - Callaway SDP Appeal Panel  
Part C - Response to Appeal Panel's Recommendations

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-4-

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-5-

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- Scott Morris, OEDO RIV Coordinator **(SAM1)**

**DOCUMENT: S:\DRS\DRSLTRS\AI 2001-G-055 CW ALARA ISSUES RESPONSE.WPD**

RIV:DRS\PSB	C:PSB	D:DRS	C:DRP\B	D:DRP	D:DNMS
LTRicketson:nh*	GMGood*	ATHowell III*	WDJohnson*	KEBrockman*	DDChamberlain*
/RA/	/RA/	/RA/	/RA/E	/RA/E	/RA/E
03/21/01	03/21/01	03/30/01	04/01/01	04/04/01	04/04/01
RC	ACES:ES	D:ACES	NRR/DIPM/IIPB	NRR/DIPM/IOLB	NRR/DIPM/IOLB
KDSmith	GMVasquez	GFSanborn	WMDean*	GMTracy	KHGibson
/RA/E	/RA/T	/RA/E	/RA/E	/RA/E	/RA/E
04/13/01	04/23/01	04/11/01	04/04/01	04/18/01	04/18/01
OE	OGC	OGC	DRA	RA	
FCongel	GSMizuno*	DCDambly	TPGwynn	EWmerschoff	
/RA/T	/RA/E	NLO per T	/RA/	/RA/	
04/25/01	04/03/01	04/ /01	05/03/01	05/04/01	

\*previously concurred

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## ENCLOSURE 1

### **BACKFIT ANALYSIS**

#### Response to Ameren/Union Electric's (UE's) Backfit Claims

In its appeal of the final significance determination and its response to the Notice of Violation (NOV), UE contends that the as low as is reasonably achievable (ALARA) portion of the Occupational Radiation Safety significance determination process (SDP), as it was applied to Callaway, and the NOV constitute backfits. In support of its contention, UE asserts that the SDP and NOV: (1) create a new regulatory requirement – dose estimates for radiation work permits must be accurate, (2) create a new and different duty on licensees for their exposure control programs, and (3) are new and different from a previously applicable staff position.

The Backfit Rule, 10 CFR 50.109, defines backfitting “as the modification of or addition to systems, structures, components, or design of a facility; or the design approval or manufacturing license for a facility; or the procedures or organization required to design, construct or operate a facility; any of which may result from a new or amended provision in the Commission rules or the imposition of a regulatory staff position interpreting the Commission rules that is either new or different from a previously applicable staff position.”

#### The SDP as a Backfit

The ALARA portion of the Occupational Radiation Safety SDP that was applied at Callaway does not result in backfitting as defined in the Backfit Rule. The SDP branch for ALARA does not impose a substantive regulatory requirement on the licensee, i.e., it does not constitute a modification of, or addition to the procedures necessary to operate the Callaway plant. In this case, the SDP determination did not change, alter or modify the NRC's requirements for implementation of an ALARA program at the Callaway plant - specifically with respect to the violation identified and described in the NOV. The NRC's determination that the ALARA requirements in 10 CFR 20.1101 were violated with five specific performance deficiencies would exist even if there was no SDP evaluation. Contrary to UE's assertion that the SDP establishes a new licensee requirement for accurate dose assessments, the Occupational Radiation Safety SDP is an internal NRC tool that was developed by NRC (with significant input from the nuclear power industry) to aid the staff in consistently determining the safety significance of inspection findings and in assessing the performance of licensees. As such, significance determinations are separate from NRC determinations of licensee violations of NRC requirements. The staff can and has made significance determinations under the SDP which are unaccompanied by violations. The licensee's assertion that the NRC established a new requirement for accurate dose assessments when assessing the NOV is a separate issue discussed below.

While the NRC acknowledges that a licensee may be adversely affected by an SDP determination, the SDP determination does not affect the determination that the licensee has violated an NRC requirement. In the Reactor Oversight Program (ROP), dose estimates are used as a screening tool to help the inspector select the jobs that need to be reviewed in detail. While there is no requirement for the dose estimates to be accurate, the NRC staff expects ALARA programs to provide “reasonably accurate” dose estimates, consistent with the guidance in Regulatory Guide 8.8. If the actual dose exceeds the projected dose by greater than 50 percent of the projected dose and the job dose is greater than 5 rem, the job will be

considered as a candidate for the SDP if the licensee has exceeded the 3-year rolling average collective dose contained in the ALARA Group 2 Question in NRC Manual Chapter 0610\*, Appendix B. However, the fact that actual doses may exceed projected doses by greater than 50 percent of the projected dose does not provide the basis for a violation; rather, this fact is used only to determine whether the NRC should increase its oversight of the licensee's radiation protection activities. In summary, because SDP determinations do not establish new, legally-binding requirements on licensees, it follows that SDP determinations are not regulatory actions which are within the purview of the Backfit Rule, and do not constitute backfits.

Apart from the strict legal definition of backfitting in the Backfit Rule, the NRC believes that SDP determinations were not intended by the Commission to be within the scope of regulatory actions for which the Backfit Rule was adopted to protect licensees. The Backfit Rule was adopted by the Commission to protect the licensee against unwarranted changes in regulatory requirements and staff positions after the NRC has given regulatory approval for licensed activity. As stated above, the SDP does not change the NRC's regulatory requirements applicable to any nuclear power plant facility, or the staff interpretation of those regulatory requirements. Since the SDP in no way changes the NRC's regulatory requirements and the staff's interpretation of these requirements, it follows that the underlying policies of the backfit rule were not implicated when the NRC adopted the SDP. Therefore, the NRC rejects the claim that the Occupational Radiation Safety SDP constitutes a backfit for the Callaway plant.

#### The NOV as a Backfit

The NOV for Callaway does not result in backfitting as defined in the Backfit Rule. The NOV was not based upon a new staff position involving dose assessment accuracy which was first articulated in the NOV. Also, the NOV was not based upon any change in relevant staff guidance with respect to dose assessment accuracy. The Callaway dose estimates (and their accuracy) were not a factor in determining the violation. The basis for the Callaway NOV was that there were programmatic performance deficiencies as identified and described in paragraphs a.-e. of the violation. None of the five listed examples refers to inaccuracy in licensee dose estimates. The mention of dose estimates in the "Contrary to" paragraph of the violation was merely a means of conveying the extent of the difference between the management-developed dose goal and the actual dose received. Indeed, an ALARA violation may be cited without any reference to dose estimates. It was not intended to suggest that the difference between the estimated versus actual doses was a fundamental aspect of the violation. Rather, the violation was premised on the fact that the difference between the estimated and actual doses was due, in part, to the five identified matters within the licensee's control. In the NRC's view, a fair reading of the "Contrary to" paragraph reflects the staff's position on the nature and basis of the NOV. Therefore, the NRC does not agree that any alleged change in staff position with respect to dose estimate accuracy in any way forms the basis for a backfitting claim.

The NRC does not agree that the need for accurate dose estimates constitutes either a new staff interpretation of the ALARA requirement in Section 20.1101(b), or a change in previous interpretations of the necessary components of an acceptable ALARA program with respect to dose estimates. Dose estimates have always been an important aspect of ALARA programs. For example, Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will be as Low as is Reasonably Achievable," Revision 3, dated June 1978, in outlining an acceptable ALARA program, discusses the

following organizational responsibilities: "Ensuring that an effective [dose] measurement system is established and used to determine the degree of success achieved by station operations with regard to the program goals and specific objectives, and ensuring that the measurement system results are reviewed on a periodic basis and that corrective actions are taken when attainment of the specific objectives appears to be jeopardized." Regulatory Guide 8.8 also states, in part: "Before entering radiation areas where significant doses could be received, station personnel should have the benefit of preparations and plans that can ensure the exposures are ALARA while personnel are performing the services. Preparations and plans should reflect . . . estimated exposure time required to complete the tasks and the estimated doses anticipated from the exposure." Further, Inspection Procedures 83729, "Occupational Exposure During Extended Outages" and 83750, "Occupational Radiation Exposure," both dated December 1998, and in use prior to the ROP, specify reviews of pre-job ALARA reviews of planned work, active review of on-going work, and post-job ALARA reviews. The procedures specify that licensees "should have an appropriate basis for establishing goals and objectives. Goals should be continuously monitored and actions taken as necessary when goals are exceeded." Moreover, inspectors are instructed to "Compare, as a minimum, the licensee's total annual collective dose (person-rem) against their goals."

Accordingly, while dose estimates are used as a point of reference, they are not required to be precisely accurate nor do they constitute limits that, when exceeded, represent violations of ALARA per se. As discussed above, the Callaway NOV was based upon the fact that part of the dose in excess of the estimated dose resulting from specific jobs could have been avoided if the licensee had properly designed and implemented appropriate work procedures and engineering controls based upon sound radiation protection principles, including sufficient ALARA planning and controls. In summary, the specific examples cited in the NOV were clearly inconsistent with ALARA principles long espoused by the staff, and there was no backfitting with respect to the citation of the Callaway violation.

Notwithstanding the above position, the NRC acknowledges that the close proximity of the discussion of SDP significance to the discussion of the inspection findings which formed the basis for the NOV can be confusing. The NRC will consider whether additional guidance should be provided to inspectors to segregate SDP significance discussions in a discrete, separately subtitled section or paragraph devoted solely to SDP significance determinations. If UE wishes, the NRC will apprise it of our final determination with respect to the desirability of such additional guidance.

## ENCLOSURE 2

### RESPONSE TO LICENSEE'S DENIAL OF VIOLATION

#### Background

NRC Inspection Report 50-483/00-17, issued October 4, 2000, documented an apparent violation of 10 CFR 20.1101(b) because there were indications that the licensee had not used, to the extent practical, procedures and engineering controls based on sound radiation protection principles to achieve occupational doses that were as low as is reasonably achievable (ALARA). The facts, as documented in the inspection report, were reviewed by the NRC, and it was determined that a violation of 10 CFR 20.1101(b) had occurred for the reasons stated in the Notice of Violation (NOV) issued January 9, 2001. The NOV is repeated here for convenience.

10 CFR 20.1101(b) requires that the licensee use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA).

Contrary to the above, during Refueling Outage 10, conducted between October and November 1999, the licensee did not use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses ALARA. Specifically, although the original dose estimate for Refueling Outage 10 indicated that plant workers would receive exposures totaling 165 person-rem, the actual dose received was 305 person-rem and a significant portion of this increase was attributable to poor ALARA work practices. For example:

- a. the licensee planned and conducted maintenance activities in the vicinity of the reactor coolant system (RCS), during a time period soon after shutdown, when area dose rates were temporarily elevated by a chemical cleaning process designed to remove radioactive particulate from RCS internal surfaces, without commensurate compensatory measures, resulting in doses that were not ALARA.
- b. the licensee planned and conducted maintenance activities in the vicinity of the steam generators before the steam generator bowl drains were flushed, resulting in higher than normal area dose rates without commensurate compensatory measures, resulting in doses that were not ALARA.
- c. the licensee conducted maintenance activities on the reactor coolant pumps and steam generators without the steam generator secondary sides filled with water, resulting in higher than normal area dose rates without commensurate compensatory measures, resulting in doses that were not ALARA.
- d. the licensee conducted maintenance activities without sufficient mock-up training to familiarize contract workers with plant equipment, use of tools, and techniques to effectively reduce the dose that they would receive.
- e. the licensee performed maintenance activities with ineffective communications between radiation protection personnel and the primary contractor, which resulted

in additional worker exposure due to ineffective planning and sequencing of work activities.

In a letter dated February 15, 2001, the licensee contests the violation of 10 CFR 20.1101(b) and provides its arguments. In general, the licensee asserts that its planning was consistent with industry practice, although it acknowledges there were areas for improvement. The licensee disagrees that commensurate compensatory measures were not taken for planned work, sufficient mock-up training was not conducted, and inadequate communication existed. The licensee also argues that the performance deficiencies cited as examples in the NOV and described in NRC Inspection Report 50-483/00-17 were not primarily responsible for the dose in excess of the projected values. In addition, the licensee states that it developed corrective actions for the problem areas before the NRC inspection and that the current enforcement of 10 CFR 20.1101(b) constituted an inappropriate backfit.

The specific licensee arguments, in order of presentation, and NRC responses are provided in the following discussion. Numbers were added by the NRC staff for ease of reference and do not imply an order of significance. Argument numbers in this enclosure refer only to the licensee's response to the violation of 10 CFR 20.1101(b) and do not necessarily correspond to the argument numbers used in the other enclosures. Comments related to the backfit implications were reviewed separately and are discussed in Enclosure 1 to this letter.

### **Licensee Arguments**

#### **Argument No.1**

Operating a nuclear power plant safely will require some occupational exposure; the amount depends on balancing the risks of exposure against the need to do maintenance and modifications to ensure safe operation and to operate the plant economically. These decisions involve many non-fungible factors, including nuclear safety risk, ALARA goals, and operating or maintenance costs. Other plants have planned to perform steam generator maintenance starting earlier in a refueling outage with a goal of reducing outage duration and hence cost and collective exposure (performing the work hot mid-loop). Performing work at hot mid-loop plant conditions trades off the potential for some higher collective exposures for jobs done sooner in the outage with higher radiation levels for lower collective exposures on jobs that are directly related to a shorter outage duration.

#### **NRC Response**

The NRC realizes that some occupational exposure will occur and does not dispute the fact that plants may perform certain activities when dose rates are higher (such as during the conditions that existed at Callaway). However, radiological controls should be commensurate with the radiological hazards. The NRC staff concludes that the licensee's ALARA planning and controls were not commensurate with the high dose rates at the licensee's facility because the performance deficiencies listed in the NOV caused the collective doses accrued by jobs to be excessive. In addition, the licensee's post-job reviews identified causal factors for doses not being ALARA, such as the conduct of work performed soon after reactor shutdown.

## Argument No. 2

The collective exposure for the outage also depends on the scope of work needed to ensure safety. For example, during Refueling Outage 10, Union Electric tried an innovative steam generator maintenance strategy, electrosleeving, to improve reactor coolant boundary integrity. The process was not as efficient as projected by the vendor. The decision to shift from electrosleeving to plugging for the last two of the four steam generators reduced collective dose for Refueling Outage 10. (Cost and schedule savings were also factors in the decision along with ALARA concerns.) The collective dose for a future outage will be higher to reflect steam generator replacement. Achieving collective exposures ALARA is a continuing balancing judgment as to what maintenance work is needed for plant safety and what actions to minimize collective dose are practical.

## NRC Response

The collective exposures were not the bases for the violation. The basis for the violation was that there were programmatic performance deficiencies, as listed in the NOV, which caused doses to be excessive. The NRC acknowledges that the total dose would have been even higher if the licensee had elected to continue with the electrosleeving process. However, by that time, a violation had already occurred. The licensee's statement about shifting from electrosleeving to plugging is only a relative comparison which has no relevance to the determination of whether a violation of 10 CFR 20.1101(b) occurred.

## Argument No. 3

ALARA regulations require licensees to have and follow a process to minimize exposure, without specifying a particular outcome. Collective dose measurement and assessment are an inexact indicator of the success of a licensee's process unless it is evaluated with judgment and experience. As such, Union Electric considers it is inappropriate to judge the success of its ALARA program based on original dose goal of 165 person-rem compared to the actual dose received of 305 person-rem and believes it is improper to conclude that a significant portion of this excess collective exposure was the result of poor ALARA work practices. Not only is the actual excess collective exposure significantly less than these numbers indicate, but also a better measure of the strength of the ALARA program at the Callaway Plant is its ability to find areas needing improvement and to initiate effective actions to reduce collective exposures.

Supporting that comparison to 165 person-rem exposure goal is inappropriate, Union Electric notes that the NOV incorrectly identifies that it originally estimated that plant workers would receive exposures totaling 165 person-rem during Refueling Outage 10. In fact, 165 person-rem was the management goal established over a year prior to the start of the exposure estimating process. The budget established at the completion of the dose estimating process, in September 1999 at the start of Refueling Outage 10, was 210 person-rem.

#### NRC Response

This violation was based on the five specific examples identified and described in the Notice of Violation and not on any direct or indirect comparison between estimated and actual doses. The NRC acknowledges that the summation of all the radiation work permit dose estimates prior to the outage was 210 person-rem and that the figure of 165 person-rem represented a pre-outage management goal. The discussion of the overall dose received during Refueling Outage 10 as part of the introduction to the five specific examples described under the NOV was intended simply to provide background describing the difference between management expectations for licensee performance and the actual dose received on an overall outage basis.

#### Argument No. 4

It is also appropriate, in evaluating Union Electric's ALARA performance during Refueling Outage 10, to adjust the original estimate by 25 percent for higher dose levels than expected during exposure estimating. Dose rate levels were found during the entry to be 25 to 50 percent higher than the dose rate levels expected during planning. Using only the lower value of 25 percent would account for 35 person-rem of the increase over the 210 person-rem budget. The estimate of dose rates during ALARA planning was properly based on past operating experience. Dose rate estimating was not included as an example of poor ALARA practices in the NOV.

#### NRC Response

As explained above, the difference between the estimated dose and the actual dose was not, in itself, the reason that the violation 10 CFR 20.1101(b) was cited. Notwithstanding that fact, even after compensating for the unexpected high dose rates, the licensee would have significantly exceeded its dose projections for individual jobs. As documented in Inspection Report 50-483/00-17, an axial offset anomaly contributed to higher than projected outage dose rates. However, the licensee acknowledged during the inspection that this factor was responsible for only approximately 25 percent of the dose overrun. ALARA performance deficiencies were primarily responsible for the remainder of the dose overrun. The following chart shows the effect of compensating for axial offset anomaly. Compare Columns 4 and 6.

1	2	3	4	5	6
Job	Radiation Work Permit	Estimated Dose	1.25 times Estimated Dose	1.25X1.5X Estimated Dose	Actual Dose
Scaffolding in the reactor building	99-50903	22.000	27.5	41.25	46.345
Remove and install steam generator manway covers and inserts	99-53321	3.992	4.99	7.485	8.543
Eddy current/robotic plugging/stabilizing/electrosleeving	99-53323	21.185	26.481	39.722	57.659
Health physics support for primary and secondary steam generator activities	99-53324	2.463	3.078	4.618	5.641
Foreign object search and retrieval	99-53022	1.500	1.875	2.812	6.388
Reactor coolant pump seal removal and replacement	99-52520	6.605	8.256	12.384	12.869
<p><b>Column 4</b> shows the estimated dose increased by 25 percent to compensate for higher dose rates caused by the axial offset anomaly (original estimate X 1.25).</p>					
<p><b>Column 5</b> shows the value that is 50 percent greater (Group 2 question for an ALARA issue) than the compensated estimate (original estimate X 1.25 X 1.5).</p>					

Argument No. 5

One of the key features of a strong ALARA program is the ability to find areas requiring improvement and take corrective action. Compliance with the ALARA requirement is judged on whether the licensee has incorporated measures to track, and, if necessary, reduce exposures. One reason for setting aggressive exposure goals prior to a job is to provide a screen to identify jobs, which warrant additional scrutiny for possible corrective actions. At Callaway, the ALARA program was working as designed; aggressive dose projections led to identifying many jobs from Refueling Outage 10 where improvements could be made. Union Electric made a decision to maintain the original estimates in the face of mounting evidence during the outage that the estimates were too low, in part, to highlight areas for potential improvement in ALARA work practices at Callaway.

NRC Response

The NRC staff concludes that the ALARA program was not working as designed because performance deficiencies caused doses to be excessive. In addition, the licensee identified

specific performance deficiencies that caused the total doses to exceed its expectations significantly. Even though corrective actions may be implemented during future outages, ALARA controls were not adequate to permit the licensee to make adjustments during jobs conducted in Refueling Outage 10.

Additionally, with the exception of the effect of higher dose rates discussed above, there is no reason to conclude that the licensee's dose projections (radiation work permit dose estimates) were particularly aggressive. Typically, these dose projections were based on historical data from past outages.

Furthermore, fundamental to a good ALARA program is the licensee's ability to determine what is a reasonably achievable dose outcome for a work activity and to establish work planning and controls necessary to achieve that outcome. There is no reason to conclude that an aggressive goal will make it easier to identify jobs which warrant additional scrutiny than a reasonably accurate dose projection. Realistic dose projections serve as points of reference to identify potential performance deficiencies and provide the bases for determining if additional exposure reducing measures are necessary. Therefore, dose projections should be based as closely as possible on the actual radiological conditions in the work areas and should be raised or lowered as changes in the conditions warrant.

#### Argument No. 6

Emergent work such as some RCP seal replacement work, resulted in an increase in scope to the Refueling Outage 10. This added work would account for 13 person-rem of the increase over the 210 person-rem budget. This emergent work should not be considered due to ALARA planning or work practices as it would establish an undesirable precedent that emergent work cannot be added to an outage without deleting other work or risking enforcement action.

#### NRC Response

As explained above, the collective exposures were not the bases for the violation of 10 CFR 20.1101(b). The basis for the violation was that there were programmatic performance deficiencies, as listed in the NOV, which caused doses to be excessive.

Furthermore, the licensee does not provide new, specific information in support of its argument. Other than reactor coolant pump seal work, the licensee does not list the jobs affected by emergent work, or explain how the 13 person-rem was distributed. Personnel interviewed during the inspection indicated that emergent work was minimal. The licensee's response implies that the NRC regarded the 210 person-rem value as a cap, above which the dose total could not be extended. This is not the NRC staff's position. However, if there is emergent work, it should have sufficient ALARA planning and controls, just as planned/scheduled work.

#### Argument No. 7

After subtracting the exposure attributable to higher dose rates and increased work scope, the remaining excess exposure for Refueling Outage 10 is 47 person-rem (about 25 percent of the 210 person-rem budget). This is the maximum possible excess collective exposure for Refueling Outage 10 attributable to ALARA work practices. In fact, the excess collective exposure attributable to ALARA is probably less than that as some of the excess is likely due to

emergent problems during the outage, such as foreign object retrieval from the steam generator.

### NRC Response

As explained above, the collective exposures were not the bases for the violation of 10 CFR 20.1101(b). The basis for the violation was that there were programmatic performance deficiencies, as listed in the NOV, which caused doses to be excessive. The violation was not cited because the actual outage dose exceeded the sum of the dose projections by some percentage.

### Licensee Arguments 8-15

In response to the examples identified in the NOV, Union Electric notes the following specific points of disagreement with NRC statements that commensurate compensatory measures were not taken for planned work, sufficient mock-up training was not conducted, and inadequate communications existed:

#### Argument No. 8

NOV Example (a): "The licensee planned and conducted maintenance activities in the vicinity of the reactor coolant system (RCS), during a time period soon after shutdown, when area dose rates were temporarily elevated by a chemical cleaning process designed to remove radioactive particulate from RCS internal surfaces, without commensurate compensatory measures, resulting in doses that were not ALARA."

This example is not a violation of 10 CFR 20.1101(b) because Union Electric did take commensurate compensatory measures for planning to conduct work in the vicinity of the RCS as early in the outage as other plants. Scheduling work in the vicinity of the RCS at this time of the outage is typical for Region IV reactor licensees. The shortening of refueling outages is a significant contributor to lowering station doses. Union Electric was selective in deciding which work to plan and conduct in the vicinity of the RCS during the shut down chemistry control phase of the outage. Only work authorized during the Outage Review Board meetings was allowed to be performed during this time period. Work that was practical to delay until the end of the clean up period was deferred.

Additionally, Union Electric did take commensurate compensatory measures as temporary shielding was installed and activities were evaluated by plant management to ensure, to the maximum extent practical, that authorized work proceeded as scheduled. These measures are consistent with the NRC policy on ALARA. Consequently, methods were in place to monitor and track doses as well as a management evaluation of the doses to be incurred by placing this work at this stage of the outage.

Union Electric performed this work at this stage of the outage in order to reduce outage duration which has one advantage of attempting to reduce overall collective dose at the station.

### NRC Response

If the compensatory measures had been commensurate with the increased radiological challenges, the actual job doses would not have been excessive. The licensee stated that commensurate compensatory measures were used; however, the only example cited was that of temporary shielding. Limiting work or performing only authorized work does not constitute a commensurate compensatory measure.

The licensee may schedule outage activities in accordance with its established practices; however, radiation protection measures should be commensurate with the radiological conditions. The licensee stated that a shorter outage is a significant contributor to lowering station doses. However, this is not true of the licensee's Refueling Outage 10 because the higher doses accrued by the early work offset any benefit of a shortened outage.

In addition, the licensee's post-job reviews identified the earlier timing of work near the reactor coolant system with less time for radioactive decay as a reason for the actual job dose being excessive.

### Argument No. 9

NOV Example (b): "The licensee planned and conducted maintenance activities in the vicinity of the steam generators before the steam generator bowl drains were flushed, resulting in higher than normal area dose rates without commensurate compensatory measures, resulting in doses that were not ALARA."

This example is not a violation of 10 CFR 20.1101(b) because Union Electric did take action to flush the steam generator bowl drains as soon as plant conditions allowed. Some work was performed in the vicinity of the steam generator bowl drains prior to flushing; however, the area(s) around the bowl drains were controlled appropriately to ensure workers would avoid these higher dose rates. The dose rates caused by the accumulation of corrosion products in these components are a "localized issue" and did not affect a significant area on the steam generator platforms. To the extent that the NOV cites Union Electric's decision to perform work under hot mid-loop plant conditions, this criticism is unjustified for the same reasons as discussed in response to NOV Example (a), above.

### NRC Response

The NRC staff concludes that the lack of sufficient ALARA planning and controls led to the dose overrun in this example. In addition, the licensee's post-job review identified the performance of work in the vicinity of the steam generator bowl drains before they were flushed as a reason for the actual job dose exceeding the projected dose. The licensee now states that this was not a significant contributor but does not supply supporting information for its change in position.

### Argument No. 10

NOV Example (c): "The licensee conducted maintenance activities on the reactor coolant pumps and steam generators without the steam generator secondary sides filled with water, resulting in higher than normal area dose rates without commensurate compensatory measures, resulting in doses that were not ALARA."

This example is not a violation of 10 CFR 20.1101(b) because Union Electric did take action to fill the steam generators as soon as plant conditions allowed. Original planning anticipated that all work on the RCP seals and motors would occur with the steam generators full. In the course of work on one side of the plant, the discovery of a foreign object during FOSAR and the FOSAR equipment becoming caught within the steam generator, delayed refill. In addition, Union Electric decided to work all four of the RCP seals and motors to improve RCS boundary integrity. During the outage, work was continued with an objective to fill the steam generators as soon as practical, both to reduce dose rates and to provide appropriate secondary side chemistry to inhibit corrosion. To the extent that the NOV cites Union Electric's decision to perform work under hot mid-loop plant conditions, this criticism is unjustified for the same reasons as discussed in response to NOV Example (a), above.

#### NRC Response

As in the previous examples, the NRC staff concludes the lack of sufficient ALARA planning and controls led to the excessive dose in this example. Compensatory actions either were not taken or were not effective to cope with the radiological conditions. The licensee acknowledges that original planning anticipated that all work on the RCP seals and motors would occur with the steam generators full. However, this did not happen and the licensee does not provide additional information about commensurate measures to compensate for the higher radiological conditions. In fact, the licensee's post-job review identified the performance of work under hot mid-loop plant conditions as a reason for the actual job dose being excessive.

#### Argument No. 11

In addition, as a measure of how disproportionate the NOV is compared to licensee performance, the specific excess exposure potentially attributable to Examples (a), (b) and (c), above, is relatively small. These three examples were identified in the NRC Inspection Report as associated with four Radiation Work Permits (RWPs).

#### NRC Response

The licensee does not provide the results of an analysis or other support for stating that exposure attributable to the lack of compensatory measures commensurate with the radiological conditions was relatively small. In personnel interviews conducted during NRC Inspection 50-483/00-17, radiation protection personnel stated that they could not quantify the doses attributable to the causal factors identified during post-job reviews.

As explained above, the collective exposures were not the bases for the violation of 10 CFR 20.1101(b). The basis for the violation was that there were programmatic performance deficiencies, as listed in the NOV, which caused doses to be excessive.

#### Argument No. 12

The NRC inspection report notes that increased dose rates were only a 25 percent factor on exposure increase. It would now appear that the NRC has determined that planning for work in areas that would result in a 25 percent increase in dose rates is a violation of ALARA regulations.

### NRC Response

The NOV was not based on a direct or indirect comparison of pre-job dose estimates to actual exposure. Therefore, the 25 percent increase in expected general area dose rates experienced at the Callaway Plant during Refueling Outage 10 did not establish an arbitrary threshold that would constitute a violation of ALARA as suggested by the licensee. The Group 2 questions are used in the reactor oversight process as a screening mechanism for entry into the significance determination process (SDP) and does use a direct comparison between estimated and actual doses as an indicator of licensee performance. The 25 percent increase in general area dose rates would affect the results of the Group 2 screening process. Since the increase in expected general area dose rates constitutes a radiological hazard and not a performance deficiency on the part of the licensee, this 25 percent increase was taken into account when applying the Group 2 screening question. See NRC Response to Argument No. 4. The SDP process was not used to determine compliance with regulations. Therefore, this 25 percent increase did not have a bearing on the staff's determination that a violation of 10 CFR 20.1101(b) had occurred. The axial offset anomaly did, however, create difficulties for the licensee. The NRC staff determined that the licensee's ALARA planning and controls were insufficient to respond to these difficulties adequately. As a result, the NRC staff determined that the doses received in relation to the five examples listed under the NOV were not ALARA.

### Argument No. 13

NOV Example (d): "The licensee conducted maintenance activities without sufficient mock-up training to familiarize contract workers with plant equipment, use of tools, and techniques to effectively reduce the dose that they would receive."

This example is not a violation of 10 CFR 20.1101(b) because Union Electric did conduct mock-up training to familiarize the contract workers with the plant, equipment, use of tools and techniques that was considered appropriate prior to the outage. The NOV assertion that work was conducted "without sufficient mock-up training" is subjective and unsupported. The NRC inspection report does not provide any specific examples of events that contributed to excess collective exposure that could have been avoided by additional mock-up training, even with the benefit of hindsight. In this case, there was training provided and it was evaluated pre-outage to be appropriate for the activities being performed. The personnel involved had training on the equipment at the vendor facilities and it was not evident during the mock-up training provided on-site that additional training was needed. Union Electric considers the mock-up training conducted prior to Refueling Outage 10 reasonable based on historical performance and considers it took reasonable actions during and subsequent to the outage when indications of inadequate training occurred. Historical man-hour and production rate estimates from the vendor had proven to be accurate and gave no indication that additional or special training would be warranted above the level historically provided. It became apparent through work progress reviews that the vendor was unable to maintain the estimates provided for the contracted work. Union Electric identified at that time that worker experience and training levels were significant contributors to the inability to meet production estimates. As a result of this inability and in an attempt to reduce overall dose, cost and schedule, Union Electric curtailed electrosleeving activities from four Steam Generators to two Steam Generators. As part of the normal review process, as well as a formal root cause evaluation, Union Electric identified improvement opportunities relative to handling and mitigating this situation.

## NRC Response

The NRC staff does not agree that sufficient mock-up training was provided as an ALARA control. The licensee's post-job reviews stated, "Across the board, the FTI [contractor] platform crews were inexperienced. For several platform workers, this was the first time they had performed the job in an operating plant." Post-job reviews also stated, "FTI personnel exhibited poor ALARA practices." One of the proposed corrective actions, from the post-job review for Radiation Work Permit 99-53323, stated, "A Pre-job ALARA Open Item Checklist has been generated for Refueling Outage 11 to review experience levels of the crews. If significant levels of inexperience exist, additional mock-up training should be pursued." The licensee identified a cause for the higher-than-projected dose and proposed a corrective action to address it. Since one cause of higher doses was worker inexperience and the solution was to provide additional mock-up training before Refueling Outage 11, then it can be concluded that insufficient mock-up training was provided during Refueling Outage 10.

## Argument No. 14

In addition, as a measure of how disproportionate the NOV is compared to licensee performance, the specific excess exposure potentially attributable to this example is relatively small. Conducting insufficient mock-up training was associated with three RWPs in the NRC Inspection Report. The actual fraction of excess exposure attributable to this example is not clear, but it could not have been a 50 percent factor on exposure.<sup>19</sup>

### **Footnote 19**

*NRC Inspection Report 50483/00-17 of October 4, 2000, enclosure Section 20S2.b, identifies the three RWPs as 99-53321, 99-53323 and 99-53324 where additional mock-up training should have been provided. Only by assuming that all of the growth of man-hours for the work could have been avoided by mock-up training would there be a 50 percent increase in exposure due to insufficient mock-up training. Union Electric, Refuel 10 ALARA Outage Report (October 2, 1999 to November 5, 1999) issued June 2000, pages 12 and 13, notes that RWP 99-53321 was for manway cover work which expended 513 man-hours compared to 300-350 normally, (about 50 percent) but also notes that some of this growth was due to response to spreads of contamination. Pages 12 and 14 note that RWP 99-53323 was for eddy current testing and electrosleeving and the man-hours for this first large scale application of electrosleeving were difficult to estimate what expected man-hour performance should have been. The man-hours for eddy current work were about twice previous experience, but this was less than half the work so could not be more than a 50 percent factor on exposure. Pages 12 and 15 note that RWP 99-53324 was for health physics support and that the man-hour growth for this RWP was about 62 percent, primarily, but not solely due to growth in the steam generator work.*

## NRC Response

The NOV was not based on a direct or indirect comparison of pre-job dose estimates to actual exposure. Under the ROP, Group 2 questions are used as a screening mechanism to determine which performance deficiencies are entered into the Occupational Radiation Safety SDP for a detailed risk characterization. One of the Group 2 screening criteria for the occupational radiation safety cornerstone requires that the actual exposure for a job exceed the job estimate by 50 percent before the issue will be considered further. The SDP process was not used to determine compliance with regulations. Therefore, this 50 percent threshold used in the Group 2 screening criteria had no bearing on the staff's determination that a violation of 10 CFR 20.1101(b) had occurred. The NRC staff determined that the licensee faced many difficulties during Refueling Outage 10, one of which was the reliance on inexperienced personnel. The NRC staff determined that the licensee's ALARA planning and controls were

insufficient in the area of mock-up training. Because of insufficient mock-up training, contract workers exhibited poor ALARA practices. For example, according to post-job reviews, some contract workers were unaware that they should move away from steam generator manway openings to reduce their dose. As a result of this and the other deficiencies, doses were not maintained ALARA, which constitutes a violation of 10 CFR 20.1011(b).

#### Argument No. 15

NOV Example (e): "The licensee performed maintenance activities with ineffective communications between radiation protection personnel and the primary contractor, which resulted in additional worker exposure due to ineffective planning and sequencing of work activities." This example is not a violation of 10 C.F.R.20.1101(b) because Union Electric did provide communications equipment for workers during foreign object removal from the steam generator. Also, to the extent the NRC is citing the lack of direct communications between steam generator vendor workers and Callaway Plant health physics personnel, the criticism is speculative. Union Electric considers that direct flow of information between vendor workers and experienced health physics personnel may help both parties work more efficiently. During Refueling Outage 10, the vendor centralized review of all ALARA observations through its on-site ALARA coordinator. Even if it is assumed that the information exchange could have been improved, that observation in no way supports a conclusion that doses were not ALARA unless one assumes the vendor ALARA coordinator was ineffective. Union Electric's vendor revised from past practice the method of coordinating ALARA reviews to put more responsibility on its coordinator. Prior to the outage, there was no reason to think that increasing vendor responsibility for ALARA was inappropriate. In fact, it would have been reasonable to believe that such increased responsibility might improve vendor ALARA performance. In hindsight, Union Electric concludes that it would be an improvement to return to the past practice of having additional experienced Callaway Plant personnel more directly involved in improving vendor ALARA performance. Previously, NRC policy encouraged innovation in implementing ALARA. It would be inconsistent with the principles of ALARA if the NRC was now creating a requirement that innovations in procedures and organizations for implementing ALARA requirements are acceptable not only if these innovations have the potential to reduce collective dose, but also if they actually reduce collective dose.

In addition, as a measure of how disproportionate the NOV is compared to licensee performance, the specific excess exposure potentially attributable to this example is relatively small. Ineffective communications between Union Electric and the primary contractor were associated with two RWPs by the NRC Inspection Report. The actual fraction of excess exposure attributable to this example is not clear, but it could not have been a significant factor on exposure.

#### NRC Response

The licensee's statement that the specific excess exposure potentially attributable to this example is relatively small is irrelevant. The basis for the violation was that there were programmatic performance deficiencies, as listed in the NOV, which caused doses to be excessive. Based on documented evidence, the NRC staff concludes that one of the programmatic performance deficiencies was ineffective communications. In a discussion about communications, the licensee's "Refuel 10 ALARA Outage Report," states, "HP [health physics personnel] seldom knew the plan for the entire upcoming shift. This made it difficult for HP to

find out the job status so they could plan their activities to reduce dose.” Additionally, the licensee identified poor communications as a causal factor for excessive dose.

#### Argument No. 16

NRC Inspections and peer evaluations of the Callaway ALARA program consistently found a strong, effectively implemented program prior to the August 2000 NRC Inspection. A March 2000 NRC Inspection looked, in part, at Union Electric ALARA performance during Refueling Outage 10 and made findings consistent with a May 1998 NRC inspection that concluded Union Electric had a very good ALARA program effectively implemented. An August 2000 NRC Inspection looked at Union Electric ALARA performance during Refueling Outage 10 and came to a dramatically different conclusion.

#### NRC Response

The March 2000 NRC inspection did not make findings consistent with the May 1998 inspection. The May 1998 inspection found a good ALARA program was implemented. The March 2000 inspection identified problems with an ALARA briefing and documented that the 3-year rolling average, collective doses for 1998 and 1999 were significantly higher than the pressurized water reactor national dose averages and were increasing.

The March 2000 inspection and the August 2000 inspection did not come to dramatically different conclusions. The March 2000 inspection findings are stated above. The August 2000 inspection resulted in three White ALARA findings and a violation of 10 CFR 20.1101(b). Even so, different conclusions would not be surprising because of the differences in inspection scopes and the amount of resources devoted to reviewing ALARA results. ALARA was only one of the areas reviewed during the March 2000 inspection, which was conducted in accordance with Inspection Procedure 83750, “Occupational Radiation Exposure.” During the March 2000 inspection, only the collective dose values of the 1999 Refueling Outage were reviewed, in part, because the licensee had not finished compiling the “Refuel 10 ALARA Outage Report,” a prime source of information on outage performance. This outage report and post-job reviews were inspected during the August 2000 inspection.

#### Conclusions

While the licensee’s work scheduling was consistent with industry practice, its ALARA planning and controls were not commensurate with the radiological working conditions associated with the licensee’s specific work schedule. If the licensee’s ALARA controls had been commensurate with increased challenges, the actual job doses would not have been excessive. The licensee emphasized its ability to find areas requiring improvement and to take corrective actions. However, even though corrective actions may be implemented during future outages, ALARA controls were not adequate to permit the licensee to make adjustments during Refueling Outage 10 jobs. The licensee’s post-job reviews identified the causes for the dose overruns, which were discussed in NRC Inspection Report 50-483/00-17. On the basis of our review of this information, as well as the information obtained through our independent inspection activity, we concluded that there were programmatic performance deficiencies, which caused doses to be excessive and the licensee to be in violation of 10 CFR 20.1101 (b).

With no new evidence to the contrary, the NRC concludes that a violation of 10 CFR 20.1101(b) occurred for the reasons stated in the Notice of Violation, issued January 9, 2001.

## ENCLOSURE 3

### **Response to ALARA SDP Fatal Flaw Issues**

In its February 7, 2001, letter to the staff, Union Electric (UE) asserted that the ALARA portion of the Occupational Radiation Safety SDP (hereafter referred to as the ALARA SDP) is fatally flawed and should be suspended until it can be revised to be consistent with existing regulatory requirements and the goals of the Reactor Oversight Process (ROP). To support this position, UE made a number of arguments. The staff has reviewed the licensee's letter and identified the following key arguments:

1. The ALARA SDP improperly assigns "low to moderate safety significance" to collective occupational doses with no safety significance.
2. The ALARA SDP assigns inappropriate level of significance to imperfections in estimating and executing work.
3. The ALARA SDP does not differentiate between factors under the licensee's control and those that are not.
4. The ALARA SDP should consider the mitigating value of licensee corrective actions.
5. The ALARA SDP's use of a mechanistic screen of average collective dose to determine safety significance is flawed.
6. The importance of whether an issue is documented is magnified by the SDP Process.
7. If dose estimates are invalid for a job, the SDP provides no correct way to assess significance of ALARA findings.
8. Multiple colors can be assigned to a single programmatic issue if it is associated with more than one job.
9. The SDP metric for ALARA has the unintended consequence of making NRC enforcement action more subjective and less predictable.

Pertinent background information and first-year SDP experiences are discussed below, followed by a description of the licensee's key arguments and the NRC's response to each.

### **Background**

One of the goals of the ROP is to reduce unnecessary burden on nuclear facilities by applying greater regulatory attention to nuclear power plants with performance problems, while maintaining a normal level of regulatory attention on facilities that perform well. The ALARA SDP was developed as a tool to help the NRC staff evaluate the overall effectiveness of a licensee's radiation protection program with respect to maintaining occupational doses ALARA. The ALARA SDP is performance-based and risk-informed. It evaluates the adequacy of the licensee's job planning and job controls (a measure of plant performance) and plant collective dose (a measure of plant performance and personnel risk) as a means of focusing attention on poorer performing plants.

The risk basis of the ALARA SDP (which is part of the Occupational Radiation Safety Cornerstone) is collective dose. In developing the ALARA SDP, the staff established three screening criteria. One of the screening criterion is based on fixed 3-year average collective doses for pressurized water reactors (PWRs) and for boiling water reactors (BWRs). ALARA issues identified at plants with 3-year average collective doses above this screening criterion (indicative of higher overall risk) are subject to evaluation using the ALARA SDP. If findings at these plants are of high enough significance, these plants may be subject to increased NRC oversight, as determined by the Manual Chapter 0305 Action Matrix. This screening criterion is also intended to provide an incentive for plants to lower their overall collective dose.

The basis for the ALARA SDP screening criteria (see Manual Chapter 0610\*, Appendix B, Group 2 questions) is discussed below. All three of the following screening criteria must be satisfied before an ALARA issue can be identified as an ALARA finding:

- The actual job dose must exceed the projected or planned dose by greater than (>) 50 percent
- The 3-year rolling average collective dose must exceed 135 person-rem/unit for a PWR or 240 person-rem/unit for a BWR
- The actual job dose must exceed 5 person-rem.

The first screening criterion asks if the actual job dose exceeds the projected or planned dose by > 50%. This criterion was developed as a means of evaluating one performance aspect of a licensee's radiation protection program. Plant Technical Specifications require that a licensee control access to high radiation areas through the use of a Radiation Work Permit (RWP) or equivalent which includes specification of radiation dose rates in the immediate work areas. Section C.3 (Radiation Program) of Regulatory Guide 8.8, "Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will be as Low as is Reasonably Achievable," Revision 3, dated June 1978, states that an effective radiation protection program requires station operational considerations in terms of job planning and record keeping. It further states that one means of planning and record keeping, an RWP, would contain the "estimated exposure time required to complete the tasks and the estimated doses anticipated from the exposure." The RWP would also contain the "actual exposure time, doses, and other information obtained during the operation."

The second screening criterion asks if the 3-year rolling average collective dose exceeds 135 person-rem/unit for a PWR or 240 person-rem/unit for a BWR. This screening criterion was developed as an indicator of the effectiveness of a plant's radiation protection program in controlling collective doses. The 3-year rolling average collective dose is widely used by industry to compare plant collective doses. The NRC staff used the median 3-year rolling average collective dose for the 1995-1997 time period (the most recent data available when these criteria were developed) to arrive at the screening criteria doses of 135 person-rem/unit for PWRs and 240 person-rem/unit for BWRs. The staff developed two separate screening criteria for PWRs and BWRs since the average dose for BWRs has exceeded the average dose for PWRs for the past 25 years in the US.

The third screening criterion asks if the actual job dose exceeds 5 person-rem. A licensee may perform as many as a thousand or more jobs during an outage. A large majority of these jobs

result in a collective dose of 1 person-rem or less. The ALARA programs at most plants state that a detailed ALARA review must be performed for any job which is expected to result in a total job dose greater than a fixed collective dose value (usually 1 or 2 person-rem). Since the ALARA SDP is risk-informed, it only focuses on jobs having higher collective dose totals (i.e., job doses which exceed 5 person-rem).

These screening criteria were developed to be objective and understandable. They are intended to screen out minor ALARA issues (issues that do not rise to the significance of an ALARA finding). The term "job," as referenced in two of the screening criteria, refers to the basic unit of related tasks or work activities which the licensee identifies for the purpose of ALARA planning and work controls. A job may be composed of multiple tasks each having its own dose estimate, but the task or work level at which detailed ALARA planning and work controls are put into place defines the term "job" as is used in the ALARA SDP.

### **First-year SDP Experiences**

During the first nine months of full implementation of the ROP, the NRC identified ALARA findings at three facilities. The significance and number of the findings varied at each of these facilities. The findings at the first facility, Callaway, are the subject of this document. The second facility received a single White ALARA finding which placed it in the Regulatory Response Column of the Action Matrix. This White finding was the result of a job which exceeded its revised job dose estimate by 25 person-rem (55% over its revised job dose estimate). ALARA program weaknesses contributing to this dose overrun included inadequate contingency planning and use of inexperienced radiation workers. The third facility received a single Green ALARA finding that placed this plant in the Licensee Response Column of the Action Matrix. This Green finding was the result of a job which exceeded its revised job dose estimate by 3.5 person-rem (approximately 65% over its revised job dose estimate). The performance weakness which resulted in this job dose overrun was the licensee's inattentiveness to track job dose rates and worker hours actively during the job evolution.

The ALARA SDP was successful in assigning a safety significance to the findings at each of these three facilities that was commensurate with the severity of the ALARA findings noted at each facility. If the ALARA SDP was fatally flawed, as suggested by UE, then it would not have been able to assign the appropriate levels of significance to each of these three plants which all had different levels of ALARA findings. The staff determined that the ALARA SDP was successful in placing these findings in the proper agency response column in the Manual Chapter 0609 Action Matrix. On this basis, the ALARA SDP satisfied the ROP goal of focusing inspections on activities where the potential risks were greater.

### **Licensee Arguments**

Argument 1 - The ALARA SDP improperly assigns "low to moderate safety significance" to collective occupational doses with no safety significance.

The licensee stated that the SDP for ALARA improperly assigns "low to moderate safety significance" to collective occupational doses that have no safety significance. Furthermore, UE states: "No worker exceeded a regulatory limit nor a Callaway administrative limit for dose during Refueling Outage 10. The cited examples of ALARA work practices were not such as to

be precursors to exceeding individual exposure limits. Consequently, there were no health or safety impacts of the identified deficiencies relating to ALARA controls.”

### NRC Response

It appears that there is a misconception regarding individual dose and collective dose with respect to use of the ALARA SDP. The risk basis for the Occupational Radiation Safety Cornerstone is personnel radiation exposure, both individual and collective. The Occupational Radiation Safety SDP is designed to evaluate the findings in the Occupational Radiation Safety Cornerstone in the following four areas: (1) ALARA findings, (2) overexposures, (3) substantial potential for overexposures, and (4) inability to assess dose. The first branch (ALARA findings branch) of this SDP was developed to evaluate ALARA findings. ALARA has historically been measured in person-rem (collective dose) which is a measure of risk to a group of individuals. Branches 2-4 (exposure control findings branch) of this SDP were developed to evaluate the risk to an individual, measured in rem. Therefore, UE's claim that collective occupational doses have no safety significance if they are not precursors to exceeding individual exposure limits is in error. The ALARA concept is based on maintaining collective doses as low as is reasonably achievable and a collective dose does not have to result in an individual overexposure to be considered significant. The NRC assumes that a linear relationship, without threshold, exists between dose and the probability of stochastic health effects (radiological risk). By this reasoning, 5 rem shared equally among 10 people (0.5 rem each) will have the same health consequence as 5 rem received by one person.

The licensee makes the statement that the “ALARA SDP improperly assigns “low to moderate safety significance” to collective occupational doses with no safety significance.” The licensee also states that a “White finding can be assigned for excess collective exposures of 9 person-rem on one job or a sum of three jobs having excess collective exposures of 5 person-rem total. The NRC has not justified why collective exposures around 10 person-rem now warrant enhanced NRC enforcement attention . . . .” The dose criteria in the ALARA SDP screening criteria (i.e., the actual job must exceed 5 person-rem and must exceed the projected or estimated dose by > 50%) represents a threshold level for plant performance more than a “risk significant” number. The NRC staff believes that a licensee should be able to plan and control a job so that the actual job dose does not substantially exceed the projected or estimated job dose. In formulating the ALARA SDP screening criteria, the NRC staff allowed a variance of 50% from the projected or estimated job dose. Instances where the actual job dose exceeds the projected or estimated dose by more than 50% are indicative of performance problems in job planning or job execution. The NRC staff established the job dose screening criteria at 5 person-rem to filter out smaller jobs and jobs which did not receive pre-job ALARA planning. As the total job dose (and hence, the excess collective exposures above the projected or estimated job dose) increases, so does the significance or magnitude of the performance problem. This response addresses the SDP appeal panel's suggestion in Enclosure 4, Part B, Section II.B.2.

### Argument 2 - The ALARA SDP assigns inappropriate level of significance to imperfections in estimating and executing work.

The licensee stated that the “SDP for ALARA actually creates a new regulatory requirement-dose estimates for radiation work permits must be accurate.” Further, UE states

that the “new ALARA SDP as implemented is fatally flawed as it assigns an inappropriate level of significance to imperfections in estimating and executing work.”

#### NRC Response

Accurate dose estimates are an indication of an effective ALARA program. The majority of plant collective dose is accrued during plant outages when most of the maintenance work is performed. In order for a licensee to minimize outage length, and thereby reduce collective doses, a licensee must perform detailed work planning well in advance of the plant outage. For those jobs where the work will be performed in high radiation areas or where the total job dose is expected to result in the expenditure of more than 1 or 2 person-rem (licensee dependent), job planning should consider job scope and worker complement, job location and radiological conditions at the job site, planned job dose, environmental conditions, and exposure controls. The Statements of Consideration for the ALARA rule (10 CFR 20.1101) state that “compliance with this requirement will be judged on whether the licensee has incorporated measures to track and, if necessary, to reduce exposures.” It further states that “the licensee should be able to demonstrate that periodic reviews of performance have been made and that efforts have been made to achieve ALARA.” If the licensee has not made a concerted effort to develop reasonably accurate exposure estimates or dose projections, then the licensee will not be able to track the progress of the work nor be able to determine when additional controls are necessary to assure that the exposures are ALARA.

The licensee also claimed that the “new ALARA SDP metric would require one aspect of the ALARA process, exposure estimating, to be executed almost perfectly to avoid White findings.” The licensee position is incorrect because all three of the ALARA SDP screening criteria must be satisfied before one can have an ALARA finding that will enter the ALARA SDP for significance (color) determination. An ALARA issue which satisfies only one or two of the screening criteria will be classified as a minor issue and will not be evaluated using the ALARA SDP. A single ALARA finding can only be designated as a White finding if the total job dose exceeds 25 person-rem, otherwise it will be designated as a Green finding. If the total job dose for the ALARA finding exceeds 25 person-rem, then it would be designated as a White finding. However, it is unlikely that a dose overrun of this magnitude would be due to poor dose estimating alone. It is more likely that other factors, such as poor ALARA practices, would have contributed to the dose overrun.

#### Argument 3 - The ALARA SDP does not differentiate between factors under the licensee's control and those that are not.

In its letter of February 7, 2001, UE stated that the:

potential that individual exposures were not minimized to the extent practical is one explanation for higher than expected aggregate exposures on a job. Other factors, not under the licensee's control, are also likely explanations, such as higher dose rates or job scope growth. In most cases, the exposure increase will be due to a mixture of these factors. In evaluating the significance of an ALARA finding as an indicator of degraded cornerstone performance, the SDP metric must differentiate between factors under the licensee's control and those that are not or the goal of the revised Reactor Oversight Process to improve focus on aspects of licensee performance will not be met.

Union Electric further stated that “not every issue that causes a job to exceed its exposure estimate by 50% is a failure of an ALARA program and should be addressed by NRC enforcement attention. Some issues are the result of aging plants requiring more maintenance or plant specific design problems.”

#### NRC Response

The NRC staff fully recognizes that factors other than ALARA program performance, such as plant aging, can have an effect on job doses. Proper job planning (e.g., use of proper shielding, additional lighting and ventilation, proper protective clothing, special tooling, mock-ups, and experienced personnel) can be effective in mitigating the negative dose effects of many factors that can result in higher job doses, such as aging equipment, hard to access job locations, and poor environmental conditions. The review of problems encountered and lessons learned from performing the same or similar jobs in the past can also be useful in planning the job to maintain doses ALARA.

The staff is also aware that job conditions or work scope can change after job planning has been done. Perturbations in the reactor coolant system can result in unexpected elevated radiation levels in portions of the plant. Component testing failures or emergent work can result in the unplanned expansion of work scope. These changes in job conditions and work scope can lead to significant increases in job doses. One way to anticipate such changes in job conditions or work scope would be to include contingency plans, whenever possible, in the Radiation Work Permits (job planning packages) to deal with such changes. ALARA controls could be implemented to stop work to consider contingency plans when radiological conditions or work scope changes. It is permissible to modify job dose estimates to account for unexpected changes in job conditions or work scope. However, good ALARA practices dictate that any such changes be made after evaluating the job situation to determine what additional ALARA precautions could be taken to ensure that doses to personnel are minimized and overall job doses are maintained ALARA. A recent nozzle repair job performed at a PWR is one example where unexpected changes to the job scope resulted in an actual job dose which greatly exceeded the original job dose estimate. However, because of the licensee’s comprehensive ALARA pre-job planning and ALARA evaluations performed during the course of the job (ALARA evaluations performed each time the projected job dose was increased), the NRC did not identify any potential ALARA issues for the job. The NRC staff will revise its inspection guidance to clarify how the inspection program and SDP account for unexpected conditions and emergent work. This response addresses the SDP appeal panel’s suggestion in Enclosure 4, Part B, Section II.B.4.

#### Argument 4 - The ALARA SDP should consider the mitigating value of licensee corrective actions.

Union Electric stated that “progress in reducing each worker’s exposure is made possible by developing improvement actions by investigating jobs where the exposure returns exceed the original estimates. The NRC is penalizing UE for having an aggressive ALARA program that finds and implements improvements in ALARA work practices.” Union Electric further stated that “Callaway has a strong ALARA program, to identify degraded performance and establish corrective actions for exposure control . . . If the SDP considered the mitigating value of licensee corrective actions, like the enforcement policy itself does, then the improvement actions initiated by Union Electric should reduce the significance associated with the NOV.”

### NRC Response

The ROP baseline inspection looks for indications of problems. Subsequent supplemental inspections will focus on the licensee's root cause evaluation and corrective actions. Unlike the enforcement policy that was in effect prior to the implementation of the ROP, the enforcement policy for the ROP does not apply mitigation discretion. The NRC is not penalizing UE for finding and implementing improvements in its ALARA work practices. Rather, the ALARA SDP findings were based on performance deficiencies identified in implementation of UE's ALARA planning and controls program during Refueling Outage 10. One function of an effective ALARA program is to conduct post-job reviews of ALARA jobs and to enter any identified problems into the licensee's corrective action program. Moreover, the ROP is based on the premise that licensees have a mature problem identification and corrective action program. "Credit" for self identification and corrective action in the enforcement policy pertain to assessment of a civil penalty. The NRC does not issue civil penalties directly for the SDP findings in the ROP and no civil penalty was considered in this case. This response addresses the SDP Appeal Panel suggestions in Enclosure 4, Part B, Section II.B.7.

### Argument 5 - The SDP's use of a mechanistic screen of average collective dose to determine safety significance is flawed.

The licensee disagreed with the use of separate rolling average collective doses for PWRs and BWRs in the second screening criterion in the Group 2 questions for ALARA. The licensee stated that the "facts at Callaway result in a violation of 'low to moderate safety significance' because the rolling average is over the PWR threshold, but the same facts would be of no safety significance if Callaway were a BWR." Furthermore, UE stated: "There can be no safety significance to the magnitude of Callaway's rolling average, however, as it is less than the 240 person-rem average for BWR plants."

### NRC Response

The screening criterion in question compares a plant's 3-year rolling average collective dose with 135 person-rem/unit if the plant is a PWR and 240 person-rem/unit if the plant is a BWR. As discussed previously, these values are based on the median 3-year rolling average collective doses for PWRs and BWRs (for the years 1995-1997). Since BWRs have historically had higher collective doses than PWRs, the screening criterion reflects this fact by assigning a higher 3-year collective dose threshold to BWRs. Collective dose can be used as a measure of plant performance. This screening criterion was developed as an indicator of the effectiveness of a plant's radiation protection program in controlling collective doses. Callaway's 3-year rolling average collective dose of 178 person-rem exceeded the screening criterion of 135 person-rem for PWRs and was the second highest 3-year collective dose of any PWR for the 1997-1999 period. This indicates that Callaway's radiation protection program could have been more effective in controlling collective doses at Callaway. Since BWRs have a higher 3-year collective dose threshold than PWRs (due, in part, to a larger worker complement and higher average worker dose), one cannot compare PWR and BWR collective doses. By its nature, ALARA is a case specific issue. What is "reasonably achievable" for a PWR is not necessarily "reasonably achievable" for a BWR. This response addresses the SDP appeal panel's suggestion in Enclosure 4, Part B, Section II.B.7.

Argument 6 - The importance of whether an issue is documented is magnified by the SDP Process.

The licensee stated that: "Once documented, a mechanistic screening process takes over that is likely to conclude there is "low to moderate safety significance." By their very nature, ALARA findings will involve more than one job. An inspector who notes a poor ALARA work practice on only one job is unlikely to consider the issue worth documenting . . . ." Additionally, the licensee stated that: "Likely, most of the ALARA issues evaluated by the ALARA SDP will be associated with multiple jobs. As the NRC Inspection Manual specifies that the inspector focus on jobs meeting the criteria for potentially White significance, any ALARA issue documented is likely to be considered of "low to moderate safety significance."

NRC Response

Paragraph 02.05 of Attachment 2 (ALARA Planning and Controls) of Inspection Procedure 71121 directs the inspector to: "Identify any job where the actual job exposure was greater than the estimated job exposure by more than 50% and the actual job exposure exceeded 5 person-rem." Nowhere does the inspection procedure state that an inspector should not identify a job meeting these criteria if it affects only a single job, as implied by the licensee. The identification of a single job which meets the Group 2 ALARA screening criteria, but which does not exceed 25 person-rem, will meet the criteria for a Green significance finding (and not for a White significance finding, as stated by the licensee). Therefore, the licensee's statement that the "NRC Inspection Manual specifies that the inspector focus on jobs meeting the criteria for potentially White significance" is not valid.

Argument 7 - If dose estimates are invalid for a job, the SDP provides no correct way to assess significance of ALARA findings.

Since one of the Group 2 ALARA screening criteria is based on the licensee's accuracy in estimating job doses, the licensee is concerned that poor job estimates (i.e., those resulting in actual job doses exceeding estimated doses by >50%) may result in ALARA findings.

NRC Response

The ALARA SDP will attach the proper safety significance to ALARA findings when used with valid (i.e., reasonably accurate) job dose estimates. However, if the job dose estimates are inflated (i.e., not based on good assumptions and correct calculations), then the ALARA screening criteria (specifically, the Group 2 ALARA screening criteria which is based on the percentage difference between the licensee's estimated and actual job dose) may not be satisfied. If the Group 2 ALARA screening criteria are not satisfied, then one would not even be able to enter the ALARA SDP to evaluate the ALARA finding. The staff is aware of this apparent weakness in the Group 2 ALARA screening criteria and will work with our stakeholders to resolve this and other concerns regarding the ALARA SDP.

As stated above, the ALARA SDP will attach the proper safety significance to ALARA findings when used with reasonably accurate dose estimates. One indication of an effective ALARA program is good job planning (including accurate job dose estimates). Regulatory Guide 8.8, "Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will be as Low as is Reasonably Achievable," Revision 3, dated June 1978, states that

an effective radiation protection program requires station operational considerations in terms of job planning and record keeping. Therefore, the licensee should ensure that its exposure estimates for jobs are based on previous experience, where possible, and are accurate and valid. Paragraph 02.06 of Attachment 2 (ALARA Planning and Controls) of Inspection Procedure (IP) 71121 states: "The significance of ALARA findings will often depend on reasonably accurate exposure estimates. Reasonable implies that they be based on good assumptions and correct calculations with some flexibility given with regard to expected variability due to the limits of forecasting." The inspection procedure directs the inspector to review applicable procedures to determine the methodology for estimating job-specific exposures and to evaluate both dose rate and man-hour estimates for accuracy. When reviewing dose projections, the NRC considers the effect of emergent work, changing radiological conditions, and scope changes before potential ALARA findings are compared to the Group 2 screening criteria.

Argument 8 - Multiple colors can be assigned to a single programmatic issue if it is associated with more than one job.

The licensee states that: "If one programmatic issue, as is the case with Callaway, is associated with more than one job, multiple colors can be assigned to that one event. This result is contrary to the stated intent from the ROP Pilot Program that each single event be given only one color significance, even if manifesting itself in multiple categories."

NRC Response

The licensee does not identify the "one programmatic issue" that it feels is "the case with Callaway." However, the argument implies that a programmatic breakdown that impacts several plant activities should only be viewed as one issue or occurrence. The NRC staff does not agree with this assertion. The revised ROP is performance based and outcome oriented. ALARA program performance is assessed, in the baseline inspection program (IP 71121 Attachment 2), on an individual work activity basis. Individual program failures that result in a dose impact on a job are identified as an occurrence or inspection finding and processed for safety significance (assigned a color). By definition, a programmatic breakdown is indicated when multiple and/or repeated individual failures are identified. Each of these failures or occurrences is evaluated for significance. Multiple findings of greater than Green significance elevates the importance of the issue(s) and NRC response through the Action Matrix. This same principle applies to other SDPs detailed in NRC Inspection Manual Chapter 0609. The result of getting to the Degraded Cornerstone Column in the NRC Action Matrix (e.g., one Yellow finding or two or more White findings) from ALARA issues alone was discussed at the March 26-28, 2001 Public Workshop on the ROP implementation lessons learned. A consensus opinion was expressed that although it did not appear that a single ALARA issue could rise to the level of Yellow significance, it was appropriate to get to a Degraded Cornerstone assessment from multiple White findings in this area. This response addresses the SDP appeal panel's suggestion in Enclosure 4, Part B, Section II.B.3.

Argument 9 - The SDP metric for ALARA has the unintended consequence of making NRC enforcement action more subjective and less predictable.

The licensee stated that: "The SDP for ALARA in practice enhances focus on inspector subjectivity." The licensee further stated that "the inspectors may have varying thresholds in

deciding which ALARA observations should be discussed with the licensee and which should be documented and essentially escalated by the SDP for ALARA. Which finding goes in which category could be subject to wide and unpredictable variation between inspectors.”

### NRC Response

The staff maintains that the process of identifying and determining the significance of ALARA findings is both objective and predictable. The criteria that inspectors are to follow is clearly detailed in the inspection procedure and the ALARA SDP, and, when implemented, will generally lead to consistent results. Specifically, Paragraph 02.05 of Attachment 2 (ALARA Planning and Controls) of IP 71121 directs the inspector to: “Identify any job where the actual job exposure was greater than the estimated job exposure by more than 50% and the actual job exposure exceeded 5 person-rem.” Once identified, each ALARA issue is subjected to the Group 1 questions contained in Appendix B of Manual Chapter 0610\* to determine if it is more than a minor issue. If it satisfies any one of the Group 1 questions, it is then subjected to the Group 2 ALARA questions (ALARA screening criteria). If it satisfies all three of the ALARA screening criteria, then, by definition, it affects the Occupational Radiation Safety Cornerstone and it is evaluated for safety significance using the ALARA SDP. If an ALARA issue is identified by the inspection process at a plant where the 3-year rolling average collective dose is less than the collective dose ALARA screening criteria, then the issue is not identified as an ALARA finding and is not subjected to analysis using the ALARA SDP.

### Summary and Conclusions

The NRC believes that the ALARA SDP is objective, understandable, predictable, and risk-informed. During the development of the ALARA SDP, the staff held frequent public meetings with the Nuclear Energy Institute’s (NEI’s) task force on the Occupational Radiation Safety Cornerstone and other stakeholders. The feedback received from the stakeholders in these meetings is reflected in the current version of the ALARA SDP. The NRC staff has utilized the ALARA SDP, with consistent results, since the ROP was implemented in April of 2000. The ALARA SDP has been successful in assigning the proper risk significance to ALARA findings documented through December 2000. For those cases previously discussed, the ALARA SDP resulted in colored significance findings which were in the appropriate response column in the Manual Chapter 0305 Action Matrix.

During the first year of implementation of the ROP, the staff identified several implementation issues associated with the ALARA SDP. The NRC formed a focus group to study these implementation issues and to suggest possible solutions/resolutions to these issues. These implementation issues, and suggested solutions/resolutions were discussed in the NRC ROP Lessons Learned Workshop held during the period March 26-28, 2001. The focus group and workshop participants agreed on the attributes needed to assess ALARA in the SDP (programmatic elements, greater significance for multiple/repeated problems, and increased significance based on dose). The focus group and workshop participants also agreed there was a need for further review of the ALARA SDP. The staff noted that three of the issues raised in UE’s February 7, 2001, letter are being addressed by these implementation issues. These are:

- The ALARA SDP does not provide a definition of job

- Similar performance at different plants can have different outcomes
- Multiple inspection findings (possibly with significance greater than green) can be assigned to one period of poor performance

While these implementation issues and the proposals raised at the workshop may result in revisions to the ALARA SDP, they do not rise to the level of “fatal flaws,” either singularly or collectively. Therefore, for the reasons discussed above, the staff does not consider the ALARA SDP to be fatally flawed and the staff does not intend to suspend its use.

## ENCLOSURE 4

### PART A

#### **Summary - Significance Determination Process Appeal Results**

NRC Inspection Report 50-483/00-17, issued October 4, 2000, documented three apparent findings involving performance deficiencies in the licensee's program designed to maintain radiation doses as low as is reasonably achievable (ALARA). Each of the findings was preliminarily determined to be White. The NRC assessed the findings documented in the inspection report using the Occupational Radiation Safety Significance Determination Process (SDP) and determined that the findings were appropriately characterized as three White findings. The Final Significance Determination for Three White Findings and Notice of Violation were issued January 9, 2001.

In a letter dated February 7, 2001, the licensee appealed the significance determination and provided its basis for the appeal. Following the guidance of NRC Manual Chapter 0609, Attachment 3, Region IV established a panel to review the licensee's appeal. The SDP Appeal Panel consisted of Gary Sanborn, Director, Allegations Coordination and Enforcement Staff, Region IV; Michael Shannon, Senior Health Physicist, Region IV; and Ronald Nimitz, Senior Health Physicist, Region I.

The SDP Appeal Panel found no significant discrepancies in the staff's application of the Occupational Radiation Safety SDP as currently structured and applied to the issues at Callaway. The SDP Appeal Panel believed the staff's decision to define "job" as the lowest level at which ALARA planning and controls take place and the staff's decision to apply that definition at the Radiation Work Permit (RWP) level at Callaway were reasonable decisions based on the available facts. Nonetheless, the SDP Appeal Panel believed that the staff should provide the licensee additional information in support of the decision to apply the definition of "job" at the RWP level at Callaway. The SDP Appeal Panel also believed that the staff should provide the licensee the basis for its determination that the findings at Callaway were more than minor (i.e., how the Group 1 questions were addressed), and its basis for rejecting the licensee's arguments to the contrary. Finally, to ensure consistent understanding and application, the SDP Appeal Panel recommended that the agency document in its procedures how the term "job" should be interpreted in applying the Occupational Radiation Safety SDP.

The SDP Appeal Panel also noted that a number of the licensee's arguments suggested a basic misconception about the SDP and its relationship to violations of NRC requirements. Specifically, the licensee appeared to lack understanding that the significance of findings was determined by the SDP without regard to whether a violation of NRC requirements existed and, similarly, that the outcome of the SDP (i.e., Green, White, etc.) was not based on the existence of a violation. The SDP Appeal Panel recommended that the staff clarify for the licensee that the outcome of the SDP and the determination of whether a violation exists are reached separately in the Reactor Oversight Process (ROP).

The licensee's arguments and the SDP Appeal Panel's evaluation are discussed in Part B. The NRC's response to the SDP Panel's recommendations is discussed in Part C.

## **PART B**

### **Conclusions and Recommendations - Callaway SDP Appeal Panel**

#### **I. Background**

The Callaway ALARA Significance Determination Appeal Panel was established by Ellis Merschhoff, Regional Administrator, NRC Region IV, by memorandum dated February 14, 2001. The appeal panel was established in response to Union Electric's February 7, 2001 appeal of the NRC's January 9, 2001, final significance determination in a case involving the ALARA program (i.e., maintaining occupational radiation exposures as low as is reasonably achievable) at UE's Callaway Plant. Mr. Merschhoff's memorandum stated that much of the information provided by UE in its February 7, 2001, letter pertained to issues other than the specific application of the Occupational Radiation Safety Significance Determination Process (SDP) and that these issues, such as UE's claim that the SDP was fatally flawed, would be addressed under other agency processes. The memorandum directed the appeal panel to review UE's arguments related to the specific application of the Occupational Radiation Safety SDP at Callaway and noted that most of these arguments were in Attachment I, Section II, of UE's response. The appeal panel has addressed UE's arguments related to the specific application of the SDP, regardless of where they were found in UE's response. In addition, the appeal panel notes that a number of UE's arguments in Attachment 1, Section II, of UE's letter is more appropriately characterized as suggestions for modifications to the Occupational Radiation Safety SDP. As such, we have highlighted these arguments for further consideration by others and have listed them in Section II of our report.

#### **II. Evaluation of Union Electric's Arguments**

In its February 7 letter, UE stated, "This appeal should be given consideration by an appeal panel as the significance determination was both inconsistent with the applicable Significance Determination Process (SDP) and lacked justification." The appeal panel grouped UE's arguments regarding the application of the Occupational Radiation Safety SDP at Callaway into three categories: (A) Retroactive Application of the Occupational Radiation Safety SDP, (B) Safety Significance of ALARA Issues, and (C) Application of "Job" Definition at the RWP Level. The appeal panel's review of the licensee's primary arguments in each of these areas follows.

##### **A. Retroactive Application of Occupational Radiation Safety SDP to Refueling Outage 10**

**Summary of UE's argument:** In its February 7, 2001, letter, UE stated that the ALARA planning function that resulted in the noted deficiencies occurred prior to the adoption of the new SDP for ALARA, resulting in an ex post facto application of a new requirement. UE said this violated any notion of due process because the ALARA planning for Refueling Outage 10 was performed under standards different from those contained in the new SDP for ALARA. In Attachment 1, Section II.A. of its response, UE stated that had UE known the revised

importance of using precisely accurate dose estimates, UE would have taken action to update the estimates during the refueling outage. Instead, UE said, it made a decision to maintain the original estimates in the face of mounting evidence during the outage that the estimates were too low, in part, to magnify the problem areas of ALARA adherence in work execution at Callaway.

**Appeal panel's evaluation:** This argument is closely associated with UE's argument that retroactive application of the Occupational Radiation Safety SDP to Refueling Outage 10 constituted a regulatory backfit, an issue that will be dealt with via the agency's backfit process. The appeal panel limited its review of this argument to whether it was appropriate under the Reactor Oversight Process (ROP) and the Occupational Radiation Safety SDP to consider an activity that occurred prior to the implementation of the ROP in April 2000.

The appeal panel found nothing in the ROP and SDP implementing procedures or guidance to suggest that performance issues associated with activities that occurred prior to the implementation of the ROP should not be considered under the ROP. In practice, we found that the SDP has been applied to activities and to performance issues that occurred prior to the implementation of the ROP (e.g., Indian Point 2, EA-00-179; Oconee, EA-00-137; Indian Point 2, EA-00-155; and Peach Bottom, EA-00-125). Enforcement Guidance Memorandum 00-001 issued March 30, 2000, stated that all enforcement issues identified during inspections that ended after April 2, 2000, would be dispositioned in accordance with the Enforcement Policy that addressed the initial implementation of the ROP. "In other words," the EGM stated, "the inspection end date dictates the Enforcement Policy to be applied and not the identification or inspection exit date." Finally, we note that Inspection Procedure 71121, "Occupational Radiation Safety," Attachment 2, ALARA Planning and Controls, directs the inspection staff to "Obtain from the licensee a list of jobs ranked by estimated exposure that are in progress or that have been completed during the last outage (the most recent outage ALARA report may be a good source for obtaining dose estimates and actual doses for previously completed jobs)." The appeal panel finds that the staff's actions were consistent with the intent of the ROP, with agency enforcement guidance, with actions in other cases, and with the specific inspection procedure utilized at Callaway.

## **B. Safety Significance of ALARA Issues**

### **1. Staff's Basis for Addressing "Group 1" Questions Not Documented**

**Summary of UE's argument:** In Attachment 1, Section I.C., UE stated that the basis for concluding the issues in the October 2000 NRC Inspection Report are of safety significance has not been adequately documented or justified. Contrary to NRC guidance, UE said, neither the inspection report nor the Final Significance Determination letter provides justification as to why the identified findings are not minor, nor do they address the alternative perspectives provided by UE in a letter dated August 21, 2000. UE noted that although it is unclear how the findings

were characterized for evaluation against these questions, the NRC stated during the exit meeting conducted August 11, 2000, that the basis for justifying documentation of the issues was that the observations have an actual or credible impact on safety. In a footnote to its response, UE noted that Inspection Manual Chapter 0610\* requires a significance evaluation paragraph that describes the logic for entering the SDP and answers the pertinent Group 1, 2, or 3 “threshold for documentation” questions and that Manual Chapter 0609 states that in cases where the staff is aware of a licensee’s alternative perspectives, the staff should give its justification for not accepting the licensee’s perspectives.

**Appeal panel’s evaluation:** UE has accurately described the current NRC guidance documents. The guidance documents in place at the time the NRC’s inspection report was issued (October 4, 2000) were not explicit with respect to addressing the pertinent Group 1, 2, or 3 questions but did state: “The assumptions used by the inspector or regional SRA in determining the issue’s significance must be documented.” As UE stated in its letter, UE was informed during the inspection exit meeting that the basis for justifying documentation of the issues was that the observations have an actual or credible impact on safety. Thus, it appears that the staff reached its decision by answering the first Group 1 question in the affirmative. Nonetheless, we agree with UE that the staff has not documented the basis for its determination. Thus, the appeal panel recommends that the staff provide UE its basis for concluding that the ALARA issues were greater than minor and that the staff address UE’s safety arguments in its August 21, 2000, letter on this point.

**2. ALARA Findings Do Not Reach “Low to Moderate” Safety Significance**

**Summary of UE’s argument:** In Attachment 1, Introduction and Summary section and elsewhere in its response, UE stated that no worker exceeded a regulatory limit nor a Callaway administrative limit for dose during Refueling Outage 10, and the cited examples of ALARA work practices in the NOV were not precursors to exceeding individual exposure limits. Consequently, UE stated, there were no health or safety impacts of the identified discrepancies relating to ALARA controls. Noting that a “white” finding indicates issues that are of “low to moderate safety significance,” UE stated that the issues at Callaway do not meet that definition under any circumstance and do not represent any safety significance.

**Appeal panel’s evaluation:** The appeal panel reviewed the staff’s adherence to guidance in Inspection Procedure 71121, Attachment 02, “ALARA Planning and Controls”; NRC Inspection Manual Chapter 0610\*, “Power Reactor Inspection Reports”; and Inspection Manual Chapter 0609, “Significance Determination Process.”

Inspection Procedure 71121, Attachment 02, directs the inspector to obtain from the licensee “a list of jobs ranked by estimated exposure that are in progress or that have been completed during the last outage (the most recent outage ALARA report may be a good source for obtaining dose estimates and actual doses for previously completed jobs).” It then directs the inspector to evaluate the exposure estimates and to “identify any jobs where the actual job exposure was greater than the estimated job exposure by more than 50 percent, and the actual job exposure exceeded 5 person-rem.” The procedure subsequently directs the inspector to develop an inspection finding for those jobs identified and to examine the causes for exceeding the exposure estimate. These procedures were followed for the Callaway inspection.

Inspection Manual Chapter 0610\* directs the inspector to use Appendix B, “Thresholds for Documentation,” in determining whether an issue should be documented in an inspection report. Appendix B instructs the inspector to use Figure 1 (a process flow chart) and Group 1, 2, and 3 questions in determining if an issue should be documented. The Group 1 questions are designed to determine whether an issue is “minor.” The first Group 1 question is: “Does the issue have an actual or credible impact on safety?” Although the staff did not document how the Group 1 questions were addressed, UE has acknowledged that the staff informed UE during the inspection exit meeting that the basis for justifying documentation of the issues was that the observations have an actual or credible impact on safety. As previously indicated, the appeal panel recommends that the staff formally provide its basis to UE.

For any issue that is considered greater than “minor,” Inspection Manual Chapter 0610\* instructs the inspector to determine if the issue affects a cornerstone by addressing the Appendix B, Group 2, questions for the relevant cornerstone. The first Group 2 question in the Radiation Safety-Occupational (ALARA) cornerstone is: “Does the actual job dose exceed the projected dose by >50 percent, AND does the 3-year rolling average collective dose exceed 135 person-rem/unit for a PWR or 240 person-rem/unit for a BWR, AND is the actual job dose >5 person-rem?” As documented in the October 4, 2000, inspection report, each of these questions was answered “yes” for the ALARA findings at Callaway. Inspection Manual Chapter 0610\* then states if the answer to any Group 2 question is “yes,” the issue should be analyzed using the SDP process, documented in the inspection report, and assigned a color.

Inspection Manual Chapter 0609 states that once an ALARA issue successfully satisfies the three screening criteria above, the designated ALARA finding is entered into the Occupational Radiation Safety SDP and is analyzed using the ALARA portion of the SDP. The first decision gate evaluates the magnitude of the actual measured job dose associated with the ALARA finding. If the actual collective job dose

associated with the finding was not greater than 25 person-rem, and if there were two or fewer such occurrences in the last rolling 18-month period, then the ALARA finding is GREEN. If there have been three or more such occurrences in the last rolling 18-month period, then the finding is WHITE. If the actual collective job dose is greater than 25 person-rem, then the finding is either WHITE or YELLOW depending on the magnitude of the plant's 3-year rolling average collective dose. If the plant's current 3-year rolling average collective dose is less than or equal to 340 person-rem (for PWRs) or 600 person-rem (for BWRs), then the finding will be WHITE. The basis for concluding that the Callaway ALARA findings were "white" was documented in the final significance determination letter issued by the staff on January 9, 2001. The appeal panel reviewed these determinations and concludes that the Occupational Radiation Safety SDP was properly applied to the findings. [See Enclosure 3, Response to Argument 1.]

In summary, the appeal panel believes that the staff should provide UE its basis for concluding that the ALARA issues were greater than minor. In all other respects, the appeal panel believes the staff followed the applicable guidance in reaching its significance determination of three "white" findings.

**3. Outage Exposure Control Should Be Viewed in the Aggregate**

**Summary of UE's argument:** In Attachment 1, Section II.B., UE argued that the Occupational Radiation Safety SDP should be applied "programmatically" and result in one "no color" finding. UE said that outage exposure controls should be viewed in the aggregate, noting that Refueling Outage 10 had a 210 person-rem budget, that only 47 person-rem of the excess exposure is attributable to ALARA work practices, and that 47 person-rem is not more than 25 percent over budget. In accordance with the SDP for ALARA, UE said, this would result in a "no color" finding.

**Appeal panel's evaluation:** There are currently no provisions in the Occupational Radiation Safety SDP guidance documents for considering ALARA planning and controls in the aggregate in determining the significance of ALARA findings. This UE argument should be considered by those reviewing UE's arguments about the adequacy of the Occupational Radiation Safety SDP. [See Enclosure 3, Response to Argument 8 and "Summary and Conclusions."]

**4. Emergent Work, Higher-Than-Expected Dose Rates Should be Considered**

**Summary of UE's argument:** In Attachment 1, Section II.B., UE argued that higher than expected dose rates during Refueling Outage 10, and the impact of emergent work on exposures should not be considered in

determining the significance of the ALARA issues at Callaway. After subtracting the exposure attributable to higher than expected dose rates and increased work scope, UE said the remaining excess exposure for the outage is 47 person-rem, about 25 percent of the person-rem budget.

**Appeal panel's evaluation:** There are currently no provisions in the Occupational Radiation Safety SDP guidance documents for considering higher than expected dose rates and emergent work in determining the significance of ALARA findings. This UE argument should be considered by those reviewing UE's arguments about the adequacy of the Occupational Radiation Safety SDP. [See Enclosure 3, Response to Argument 3.]

#### 5. **NRC Erred in Using 165 Person-Rem Outage Exposure Estimate**

**Summary of UE's argument:** In Attachment 1, Section II.B., UE stated that NRC erred in using 165 person-rem as the exposure estimate for Refueling Outage 10 (Note: The staff made reference to the 165 person-rem estimate in its final significance determination letter dated January 9, 2001). The 165 person-rem goal, UE said, was a management goal established a year before the outage exposure estimating process began. The exposure estimate at the completion of the dose estimating process, UE said, was actually 210 person-rem. UE also said, "Whether 'job' is defined as an RWP or a WAD, the aggregate of those estimates for Refueling Outage 10 at Callaway was 210 Rem . . . . Since, the dose estimates on RWPs are sums of the WADs covered by each RWP, the dose estimate for Refueling Outage 10 would be the same regardless of whether the job is defined at the WAD or RWP level. In September 1999, 1 month prior to the Refueling Outage 10, either of these sums was 210 person-rem."

**Appeal panel's evaluation:** The appeal panel does not believe that this issue affected the outcome of the SDP for the ALARA findings that were considered. Nonetheless, the appeal panel recommends that the staff consider UE's statement that the staff erred in referring to the 165 person-rem estimate and correct the record on the docket, if appropriate to do so. The appeal panel also notes that UE's February 7, 2001, letter implies that dose estimates were available at the WAD level for all of the Refueling Outage 10 jobs. If true, this would be new information not previously considered by the staff in reaching its decision. The appeal panel recommends that the staff clarify with UE its meaning in saying "Since, the dose estimates on RWPs are sums of the WADs covered by each RWP, the dose estimate for Refueling Outage 10 would be the same regardless of whether the job is defined at the WAD or RWP level. In September 1999, 1 month prior to the Refueling Outage 10, either of these sums was 210 person-rem."

**6. ALARA Findings Should be Causally Related to NOV**

**Summary of UE's argument:** In Attachment 1, Section II.C., UE stated that the NRC inspection manual identifies greater than 5 person-rem jobs which exceeded exposure estimates by more than 50 percent as a good screen to focus inspection. UE said the SDP then inappropriately translates these screening criteria into a color significance decision tree that makes the mere existence of such jobs a finding. UE argued that to be determined of potential significance, a job with over 5 person-rem exposure should have the excess exposure causally related to the violation of ALARA noted during the inspection. UE said that the only excess exposure that should be considered for the selected jobs is that which is attributable to the degraded ALARA work practices noted in the NOV. Had this been done, UE said, the conclusion would have been findings with "no color."

**Appeal panel's evaluation:** There are currently no provisions in the Occupational Radiation Safety SDP guidance documents for considering only excess exposure attributable to degraded ALARA work practices in determining the significance of ALARA findings. This UE argument should be considered by those reviewing UE's arguments about the adequacy of the Occupational Radiation Safety SDP. [See Enclosure 3, Response to Argument 1.] In addition, the appeal panel notes that UE's arguments (here and in other locations) suggest a belief that there is or should be a direct correlation between the ALARA "white" findings and the issues in the Notice of Violation. UE appears to lack understanding that the significance of findings is determined by the SDP without regard to whether a violation of NRC requirements exists and, similarly, that the outcome of the SDP (i.e., green, white, etc.) is not based on the existence of a violation. We recommend that the staff clarify for UE that the outcome of the SDP, and the determination of whether a violation exists are reached separately in the Reactor Oversight Process.

**7. Significance of ALARA Findings Overstated by SDP**

**Summary of UE's argument:** In Attachment 1, Section II.D., UE again said that the proper result should be one finding of "no color" and said the NRC should consider the following ways in which the Occupational Radiation Safety SDP overstates the significance of the finding:

- (1) UE noted that the reason Callaway's 3-year rolling exposure average exceeds other PWRs is due in large part to plant design issues and the maintenance strategies selected. If this information were tempered with judgment, UE asserts, the answer to the SDP screening criteria as to whether the average collective dose is above average should be "yes, but not above average for a plant with an axial offset anomaly and old Westinghouse Inconel 600 tubes in its steam generators."

- (2) UE argued that the SDP should consider the mitigating value of licensee corrective actions, like the enforcement policy itself does, and that this should reduce the significance associated with the NOV.
- (3) UE argued that the NRC should take into account UE's conscious decision to spend additional effort on investigating the causes of dose overruns and not on correcting the unrealistic dose estimates.

**Appeal panel's evaluation:** There are currently no provisions in the Occupational Radiation Safety SDP guidance documents for considering the basis for a plant's 3-year rolling average, corrective actions, or management decisions in determining the significance of ALARA findings. These UE arguments should be considered by those reviewing UE's arguments about the adequacy of the Occupational Radiation Safety SDP. [See Enclosure 3, Response to Argument 4 and 5.]

### **C. Application of "Job" Definition at the RWP Level**

**Summary of UE's argument:** UE stated in its letter that the NRC should have analyzed "jobs" to reflect Union Electric's intent that the Work Authorizing Document (WAD) is the lowest level of ALARA planning. In Attachment 1, page 15, UE noted that the Occupational Radiation Safety SDP does not define the term "job," identify what "job associated with an ALARA finding" means, or identify how many jobs should be used to find the significance of any one ALARA finding. In Attachment 1, Section II.D., UE said the controlling factor to determine what is a job should be what UE's procedures intend to be the lowest level. UE said its procedures, which were not criticized in the NRC's inspection report, intend the lowest level of ALARA planning to be the WAD. If "job" is defined at the WAD level and not the RWP level, UE said, then there were five jobs that exceeded 5 person-rem, but none that exceeded 25 person-rem. UE said that the significance of having five jobs exceed their dose estimate by over 50 percent is one white finding, but stated that UE now believes that a "no color" finding is appropriate.

**Appeal panel's evaluation:** The staff's January 9, 2001, final significance determination letter to UE acknowledged that "job" is not defined by the SDP and its supporting guidance. The staff's letter stated, "However . . . the term 'jobs' in the Occupational Radiation Safety SDP clearly corresponds to those work activities for which distinct ALARA planning and controls are implemented . . . we conclude that your ALARA planning and controls were primarily implemented at the Radiation Work Permit (RWP) level rather than at the WAD level for the work activities in question." For each of the three white findings, the staff's letter provided a brief explanation for the staff's decision to examine ALARA planning and controls at the "job" rather than the "WAD" level. For each of the three white findings, the staff indicated what aspects of ALARA planning and controls that were not implemented at the WAD level.

The appeal panel believes that the staff's definition of "job" as the lowest level at which ALARA planning and controls take place, and the staff's interpretation of "job" in the context of the Occupational Radiation Safety SDP are both reasonable. It would be difficult to evaluate ALARA planning and controls at any level where the full range of ALARA planning and controls did not occur. The staff's conclusion appears to have been based on the available evidence which indicated that despite UE's intent, in practice, the full range of ALARA planning and controls occurred at the RWP level. [Note: The appeal panel learned from the staff that UE's response neither referenced Callaway's ALARA planning and control procedures, nor claimed that these procedures were being applied at the WAD level. We note this for information only because the staff has not noted this on the docket.]

With the possible exception of the new information discussed in II.B.5 above, the available, docketed information does not demonstrate that UE had consistently performed dose estimates at the WAD level. We also note that this new information is inconsistent with information previously obtained by NRC inspection staff, based on our discussions with them. Further, there is no documented basis indicating that UE performed ALARA oversight of work activities at the WAD level to identify anomalous exposure accumulation or exposure overruns.

Notwithstanding the appeal panel's agreement that the staff's decisions were reasonable under the circumstances, given the attention being focused on the staff's decision in this case, the appeal panel recommends that the staff provide UE a more detailed explanation for its decision to apply the term "job" at the lowest level where distinct ALARA planning and controls take place. In addition, the panel recommends that the staff provide UE a more detailed explanation for its decision to focus on the RWP level in applying the SDP at Callaway, despite UE's stated intent that ALARA planning and controls occur at the WAD level. Finally, we recommend that the agency document in its procedures how the term "job" is to be interpreted in the context of the Occupational Radiation Safety SDP.

### **III. Summary of Appeal Panel's Recommendations**

1. The appeal panel recommends that the staff provide UE its basis for concluding that the ALARA issues were greater than minor (i.e., address how the Group 1 questions were applied), and that the staff address UE's safety arguments in its August 21, 2000, letter on this point.
2. UE stated that the staff erred in using 165 person-rem as the exposure estimate for Refueling Outage 10 and that the exposure estimate at the completion of the dose estimating process was actually 210 person-rem. (Note: The staff made reference to the 165 person-rem estimate in its final significance determination letter dated January 9, 2001). The appeal panel recommends that the staff consider UE's statement that the staff erred in referring to the 165 person-rem estimate and correct the record on the docket, if appropriate to do so.

3. The appeal panel recommends that the staff clarify with UE its meaning in saying “Since, the dose estimates on RWPs are sums of the WADs covered by each RWP, the dose estimate for Refueling Outage 10 would be the same regardless of whether the job is defined at the WAD or RWP level. In September 1999, one month prior to the Refueling Outage 10, either of these sums was 210 person-rem.”
4. The appeal panel recommends that the staff clarify for UE that the outcome of the SDP and the determination of whether a violation exists are reached separately in the Reactor Oversight Process.
5. The appeal panel recommends that the staff provide UE a more detailed explanation for its decision to apply the term “job” at the lowest level where distinct ALARA planning and controls take place.
6. The appeal panel recommends that the staff provide UE more details supporting its decision to focus on the RWP level in applying the SDP at Callaway, despite UE’s stated intent that ALARA planning and controls occur at the WAD level.
7. The appeal panel recommends that the agency document in its procedures how the term “job” is to be interpreted in the context of the Occupational Radiation Safety SDP.

**PART C**

**Response to Appeal Panel's Recommendations**

1. The revision of NRC Manual Chapter 0610\* in effect at the time of the inspection (issued April 2000) instructed the inspector to use Appendix E, "Group 1 Questions," as a filter to determine if an issue could be considered minor. Appendix E provided seven Group 1 Questions. (The questions were reduced to four in October 2000). The guidance stated that if the answer to any question was "Yes," the issue was considered more than minor. At the exit briefing, the inspector stated that the answer to Question 1, "Does the issue have an actual or credible impact on safety?" was "yes."

In its August 21, 2000, letter, the licensee addressed the seven Group 1 Questions and concluded the answers to all questions should be "No." With regard to Question 1, the licensee stated:

In the context of ALARA findings, Callaway is not aware of any rulemaking decisions, Branch Technical Positions, or other endorsed publications that now place a statistically acceptable risk limit on occupational population dose, above which would be considered a violation of regulation. The statistically significant dose levels impacting safety, therefore, appear to remain at the occupational dose limits for an individual. Consequently, an actual or credible impact on safety would be bounded by the criteria for an actual or credible occupational exposure to an individual above regulatory limits.

There is no limit on occupational population dose. However, population dose is the sum of individual doses. The NRC believes that the individual radiation doses that are not ALARA have a credible impact on safety. The NRC's position can be found in Regulatory Guide 8.29, "Instruction Concerning Risks From Occupational Radiation Exposure, Revision 1 (February 1996). Regulatory Guide 8.29 states:

The National Council on Radiation Protection and Measurements (NCRP), the International Commission on Radiological Protection (ICRP), and other standards-setting organizations assume for radiation protection purposes that there is some risk, no matter how small the dose. . . . Because the scientific evidence does not conclusively demonstrate whether there is or is not an effect at low doses, the NRC assumes for radiation protection purposes, that even small doses have some chance of causing cancer. Thus, a principle of radiation protection is to do more than merely meet the allowed regulatory limits; doses should be kept as low as is reasonably achievable (ALARA).

Moreover, the issue relates to "adequate protection" as used in 10 CFR Part 20. In the May 1991 Statements of Consideration for the revised Part 20, the re-evaluation of the radiation dose risk factors is discussed in Sections F-H. In response to a question about why the NRC was not lowering its dose limit from 5 rem to 2 rem per year, the Commission stated (in Section I) that, "Due to the practice of maintaining the radiation

exposures ALARA . . . , the average dose to occupationally exposed individuals is well below the limits in either the previous or amended Part 20 and also below the limits recommended by ICRP (2 rem per year). Therefore, it is the 5 rem dose limit and ALARA that provides the level of “adequate protection” in 10 CFR Part 20. Accordingly, the NRC identified “maintaining radiation doses within the limit and ALARA” as the objective of the Occupational Radiation Protection Cornerstone in SECY 99-007.

Finally, it is important to note that the findings identified during the inspection all met the SDP screening criteria in the Group 2 questions. Had the findings been truly minor, they would have been screened out using the Group 2 questions. In other words, findings that impact a cornerstone -- any “yes” to a Group 2 question -- are, by definition, more than minor.

2. In retrospect, the NRC agrees that it would have been more appropriate for the Final SDP letter and NOV to have referenced 210 rem, rather than 165 rem. The NRC does not wish to discourage management’s use of aggressive dose goals. Refer to the NRC Response to Argument 3 of Enclosure 2.
3. With this letter, the licensee is requested to provide, in writing, further clarification of the statement questioned by the SDP Appeal Panel. Specifically, please clarify the following statement:

Since, the dose estimates on RWPs are sums of the WADs covered by each RWP, the dose estimate for Refueling Outage 10 would be the same regardless of whether the job is defined at the WAD or RWP level. In September 1999, one month prior to the Refueling Outage 10, either of these sums was 210 person-rem.

This statement implies that there were dose estimates at the WAD level for all jobs, including scaffolding work. This was not the NRC’s understanding based on inspection interviews and regulatory conference discussions. It would constitute new information.

4. See Enclosure 1 - Backfit Analysis.
5. This issue was discussed at the ROP Lessons Learned Workshop held during the period March 26-28, 2001. (Refer to Enclosure 3, Summary and Conclusions.)
6. A regulatory conference was conducted with the licensee on November 9, 2000, to discuss the findings of NRC Inspection 50-483/00-17. During the conference, the licensee asked for and was granted the opportunity to provide additional information about the inspection findings. The information (Callaway Letter - ULNRC 4343 - November 16, 2000) was reviewed by the staff and the following analysis was provided for internal review in preparation for discussions between Region IV, the Office of Nuclear Reactor Regulation, and the Office of Enforcement.

In its letter of November 16, 2000, the licensee took issue with the significance determination and the way that “job” was defined during the inspection. The licensee sought to show that ALARA planning and controls were implemented on the individual units of work that were subsets of the radiation work permits and not the radiation work

permit as a whole. This would have limited the number of work units that exceeded the 5-rem threshold in the Group 2 questions and would have eliminated any work units that exceeded the 25-rem threshold in the Occupational Radiation Safety Significance Determination Process. In support of its position, the licensee stated:

Callaway Plant procedures use the Work Authorizing Document (WAD) as the document that classifies a particular activity as a 'job.' Work Authorizing Documents may be Work Requests (corrective maintenance), Preventive Maintenance Requests (PMR), Surveillance Task Sheets, Modifications, HP generated WADs or Scaffolding Permits. All of these are referred to as Work Requests (WRs), work packages, or WADs in the Work Control System and Radiation Work Permit (RWP) System.

Even though a WAD was not defined in the licensee's procedures, licensee personnel stated that the interchangeability of terms (WAD equals work request equals scaffolding permit, etc.) was implicit from the way the procedures were used and the way the licensee implemented its processes.

Additionally, the licensee referenced Procedure PDP-ZZ-00003, "Work Document Processing," and the flow path that WADs follow. Procedure PDP-ZZ-00003 included some instructions that address ALARA. The procedure instructed the planners to: include ALARA concerns, limit time in the radiological controlled area, use mockup training, review the work authorizing document history to identify lessons learned, walk down work areas, and include photos in the work authorizing documents. Section 4.5.3 of the procedure instructed work planners to review the questions on the Work Process Information Sheet (Attachment 2 of the procedure), complete it if any answer was positive, and provide it to the Radiation/Chemistry Planner.

Region IV and NRR staff members reviewed Procedure PDP-ZZ-00003 and confirmed that a cursory ALARA review by a work control planner was required by the procedure. However, this review is conducted by planners who may belong to various disciplines, such as, mechanical maintenance, electrical maintenance, instrumentation and control, or construction (i.e., non-health physics personnel). The NRC concluded that the preliminary ALARA review conducted by work control planners was limited. Additionally, in followup conversations with licensee representatives, the NRC determined that there were no completed Work Process Information Sheets, as required by the procedure, to support the licensee's contention that ALARA planning was conducted on individual work authorizing documents.

The NRC reviewed the jobs documented in NRC Inspection Report 50-483/00-17 and reached the following conclusions:

a. Scaffolding (RWP 99-50903)

The licensee stated that the scaffolding work should be considered as 161 separate permits, with only one exceeding 5 rems.

The licensee's argument did not address the fact that each scaffolding package did not receive individual ALARA planning and dose projections, and it did not

reference all pertinent implementing procedures. Dose projections are an important part of ALARA controls because they provide a quantitative means by which performance is measured and an indicator of the need to stop work and conduct additional planning. Procedure PDP-ZZ-00003 did not provide instructions to initiate dose projections at the WAD level. However, Health Physics Procedure HTP-ZZ-01102, "Pre-Job ALARA Planning and Briefing," Revision 14, (not referenced by the licensee in its response) addressed dose projections on the radiation work permit level. Step 4.3.4 instructed the health physics technicians to review the radiation work permit master file for completeness and accuracy, including man-hour and person-rem estimates/calculations. Consequently, the dose projection for all scaffolding work was on the radiation work permit level.

In-progress reviews are another important ALARA control. Again, Health Physics Procedure HTP-ZZ-01102 provided for dose thresholds in Section 4.4, "Job In-Progress ALARA Review." The licensee performed a "job in-progress ALARA review" on October 10, 1999, for all scaffolding when the radiation work permit dose exceeded the projected value of 22 rems.

Health Physics Procedure HTP-ZZ-01103, "Post Job Review," Revision 12, Section 4, (not referenced by the licensee in its response) provided guidance for performing post-job reviews at the radiation work permit level. The licensee conducted a post-job review of scaffolding work at the radiation work permit level.

The licensee implemented ALARA controls on the radiation work permit level; therefore, the NRC concluded that the radiation work permit constituted the job. Since the job accrued more than 25 person-rems, it constituted an individual White finding.

b. SG Manway Covers and Inserts (RWP 99-53321)

The licensee did not project doses and implement controls on the WAD level. Dose projections were made at the radiation work permit level. There were no Work Processes Information Sheets at the WAD level. A post-job review was performed at the radiation work permit level but not at the WAD level. Therefore, the radiation work permit was a job which accrued more than 5 person-rems (a Green finding if considered individually).

c. Eddy Current/Robotic Plugging/Stabilizing/Electrosleeving (RWP 99-53323)

The licensee had dose projections on the WAD level. However, there were no Work Processes Information Sheets completed at the WAD level. A job in-progress review was performed at the radiation work permit level but not at the individual WAD level. A post-job review was performed at the radiation work permit level but not at the individual WAD level. Therefore, the radiation work permit was a job. Since the job accrued more than 25 person-rems, it constituted an individual White finding.

d. Health Physics Support for Primary and Secondary SG Activities (RWP 99-53324)

There were only one WAD and one radiation work permit. Therefore, the radiation work permit was a job which accrued more than 5 person-rems (a Green finding if considered individually).

e. Foreign Object Search and Retrieval (RWP 99-53022)

Only one WAD had a dose projection out of a total of eight WADS. There were no Work Processes Information Sheets at the WAD level. A post-job review was performed at the radiation work permit level but not at the WAD level. Therefore, the radiation work permit was a job which accrued more than 5 person-rems (a Green finding if considered individually).

f. Reactor Coolant Pump Seal Removal and Replacement (RWP 99-52520)

Dose projections were made at the WAD level. However, there were no Work Processes Information Sheets at the WAD level. A post-job review was performed at the radiation work permit level but not at the WAD level. Therefore, the radiation work permit was a job which accrued more than 5 person-rems (a Green finding if considered individually).

Summary:

The licensee's process included some basic ALARA considerations at an early stage. However, other than a few dose projections, there was no evidence of meaningful ALARA planning or controls implemented before work activities were included in radiation work permits. As a result, the staff concluded, that at the Callaway Plant during Refueling Outage 10, radiation work permits were synonymous to ALARA jobs.

Of the six jobs that exceeded their dose projections by more than 50 percent, two jobs accrued actual doses greater than 25 person-rems and constituted White findings because the licensee's 3-year rolling average collective dose exceeded 135 person-rems. In addition, since there were four other jobs that accrued more than 5 person-rems, these constituted an additional White finding, for a total of three White findings.

7. This issue was discussed at the ROP Lessons Learned Workshop held during the period March 26-28, 2001. (Refer to Enclosure 3, Summary and Conclusions.)