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Callaway Plant

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February 7, 2001



U. S. Nuclear Regulatory Commission
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ULNRC-4378

Gentlemen:

**APPEAL OF FINAL SIGNIFICANCE DETERMINATION
INSPECTION REPORT NO. 50-483/00-017
CALLAWAY PLANT
UNION ELECTRIC CO.**

- Ref: 1) ULNRC-4298, dated August 21, 2000
2) EA-00-208, dated October 4, 2000
3) ULNRC-4343, dated November 16, 2000
4) EA-00-208, dated January 9, 2001

Union Electric appeals the NRC Staff's final significance determination as set forth in the letter of January 9, 2001, from Ellis W. Merschoff, Regional Administrator, Region IV, to Garry L. Randolph, Senior Vice President and Chief Nuclear Officer, Union Electric, for the three findings identified under NRC Inspection Report 50-00483/00-17. This appeal should be given consideration by an appeal panel as the significance determination was both inconsistent with the applicable Significance Determination Process (SDP) guidance and lacked justification (appeal category 3.b, NRC Inspection Manual Chapter 0609, Attachment 3).

On January 23, 2001, Mr. William D. Johnson, Chief, Division of Reactor Projects, Branch B, advised Union Electric that the deadline for submitting this appeal had been extended to February 7, 2001.

Pursuant to the requirements of 10 CFR 2.201, Union Electric will submit, under separate cover, a written response to the Notice of Violation (NOV) accompanying the January 9, 2001, letter.

To preface the ensuing discussion, with noted exceptions, the Reactor Oversight Process (ROP) has exhibited marked improvement over the former inspection and enforcement process with regard to objectivity, scrutability, regulatory focus on risk significance, and the reduction of unnecessary regulatory burden. Throughout the implementation and transitional period into the ROP, the Staff has endeavored to maintain strict adherence to the program as designed. These efforts to preserve the integrity of the process should yield more meaningful observations regarding the usability, effectiveness and consistency of the ROP in light of the upcoming comment period for the first year of implementation. In addition, strict adherence to the ROP guidelines has generally provided for a more predictable and consistent characterization of inspection findings within an inspected area and, to a limited degree, from area to area across the spectrum of the inspection program.

In approving implementation of the revised ROP and termination of the previous assessment process, Systematic Assessment of Licensee Performance, the Commission noted that this action “will inevitably reveal issues that were not exposed in the pilot program. The [NRC] staff should anticipate that adjustments – perhaps significant adjustments – will be necessary as the program unfolds. As a result, there should be a continuing open dialogue with NRC licensees, other stakeholders, and staff, as issues are encountered.” This appeal is a formal part of that dialogue anticipated by the Commission.

The issues discussed in detail in this appeal have a direct and adverse impact on the integrity of the ALARA portion of the ROP and, subsequently, the goals of objectivity, scrutability, focus on risk significance and the reduction of unnecessary regulatory burden. Union Electric believes that the SDP for ALARA is fatally flawed and should be suspended until it can be revised to be consistent with existing regulatory requirements and the goals of the ROP. The SDP for ALARA improperly assigns “low to moderate safety significance” to collective occupational doses that have no safety significance. It is subjective, inscrutable, less predictable, does not focus on risk significance and creates a new regulatory burden. The SDP creates a new and different duty on licensees for their radiation exposure control programs. As implemented by the NRC Staff, it is new or different from a previously applicable staff position without the systematic and documented analysis required by 10CFR 50.109.

Even if the NRC were to conclude that the new SDP for ALARA is not fatally flawed and should be enforced, it was not properly applied at Callaway. In particular, 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. This violated any notion of due process because the ALARA planning for

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Refueling Outage 10 was performed under standards different from those contained in the new SDP for ALARA. As a minimum, the NRC should have appropriately analyzed "jobs" to reflect Union Electric's intent that the Work Authorizing Document is the lowest level of ALARA planning. Even if the SDP for ALARA were to be applied retroactively, an appropriate evaluation of the five examples cited in the NOV should result in findings of "no color."

Union Electric understands that the SDP for ALARA resulted from a well-intentioned attempt to establish a metric for inspection of the ALARA programs at nuclear plants. The new Regulatory Oversight Process has made many needed improvements to the inspection and enforcement at nuclear plants and Union Electric strongly supports the effort. Union Electric's experience with the SDP for ALARA, however, suggests that it is inconsistent with the risk-informed basis of the Regulatory Oversight Process and counter-productive to the intent of ALARA.

As a matter of clarification it should be noted the 165 person-rem goal discussed in the Final Significance Determination letter was not the refuel dose projection. As noted at the Regulatory Conference the Dose projection was 210 person-rem based on planned Work Authorizing Documents for Refueling Outage 10.

The details of this appeal are included in Attachment 1. None of the material in this appeal is considered proprietary by Union Electric.

If you have any questions regarding this response, or if additional information is required, please contact me.

Very truly yours,



G. L. Randolph

GLR/JVL/MAR/mib

Attachment: 1) Appeal of Final Significance Determination

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ATTACHMENT 1

APPEAL OF FINAL SIGNIFICANCE DETERMINATION ASSOCIATED WITH ALARA NOTICE OF VIOLATION

(NRC INSPECTION REPORT 50-483/00-17, CALLAWAY PLANT)

This enclosure describes in detail the bases for this appeal to the NRC Staff's determination of significance for the identified three White findings set forth in a letter dated January 9, 2001 from Ellis W. Merschoff, Regional Administrator, Region IV, to Garry L. Randolph, Senior Vice President and Chief Nuclear Officer, Union Electric Company. Union Electric will respond separately, as required, to the Notice of Violation (NOV) accompanying the January 9 letter.

INTRODUCTION AND SUMMARY

In general, Union Electric does not disagree that there were areas requiring improvement in its performance of ALARA controls during Callaway Refueling Outage 10 in October 1999. All of the information set forth in the NOV was self-identified by Union Electric prior to the NRC inspection during August 2000. Before Refueling Outage 10 was completed, Union Electric requested an Institute of Nuclear Power Operations (INPO) Assist Visit to evaluate the performance of its ALARA program, which was conducted in January 2000. Furthermore, Union Electric conducted a thorough self-assessment with industry peer evaluators in June 2000. A formal root cause evaluation was completed in November 2000. Performance deficiencies and corrective actions were entered into the Callaway Corrective Action Program. Lessons learned are being incorporated into the planning for Callaway Refueling Outage 11. Union Electric considers escalated enforcement by the NRC inappropriate for having an ALARA program that can find and initiate issues in execution of work.

Union Electric disagrees with the NRC Staff's application of the new Significance Determination Process (SDP) as it has been applied to ALARA planning and controls, both in general and specifically at Callaway. The cornerstone activity under consideration is Occupational Radiation Safety, which is to ensure adequate protection of worker health and safety from exposure to radiation from radioactive material during routine civilian nuclear reactor operation.¹ No worker exceeded a regulatory limit nor a Callaway administrative limit for dose during Refueling Outage 10. The cited examples of ALARA work practices in the NOV were not precursors to exceeding individual exposure limits. Consequently, there were no health or safety impacts of the identified deficiencies relating to ALARA controls.² Yet, a White

¹ NRC Inspection Manual Chapter 0609, Appendix C

² Union Electric previously articulated its position on the lack of safety significance of the ALARA inspection findings in a letter on August 21, 2000 from R. D. Affolter (Manager,
Footnote continued on next page

finding indicates issues that are of “low to moderate safety significance.”³ The issues at Callaway do not meet that definition under any circumstance. The areas for improvement in ALARA controls that Union Electric identified at Callaway were not desirable and Union Electric has taken aggressive action to correct them. Nevertheless, they simply do not represent any safety significance.

Our research has not identified an enforcement action under previous inspection and enforcement policies relating to inspection of an ALARA program at a commercial nuclear facility. This is not surprising because all nuclear plant licensees have an ALARA program⁴ and conduct their operations and maintenance activities in a manner generally consistent with that program. The SDP for ALARA actually creates a new regulatory requirement – dose estimates for radiation work permits must be accurate. This interpretation of 10 C.F.R. § 20.1101(b) is without doubt “new or different from a previously applicable staff position.”⁵ Commission precedent and due process in implementing administrative changes dictate that changes in a Commission policy may not create a new regulatory requirement.

Union Electric believes that the issues addressed in this appeal have a direct and adverse impact on the integrity of the ALARA portion of the new Reactor Oversight Process (ROP) and its goals of objectivity, scrutability, focus on risk significance and the reduction of unnecessary regulatory burden. Careful consideration of these issues calls into question the appropriateness and justification of the SDP for ALARA. Union Electric concludes that the SDP for ALARA is fatally flawed and should be suspended until it can be revised to be consistent with existing regulatory requirements and the goals of the ROP.

Even if the NRC concludes that the new SDP for ALARA is not fatally flawed and should be enforced; for the reasons discussed in the second section of this letter, it was not applied appropriately at Callaway in any event. In particular, 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. This violates any notion of due process, as the ALARA planning function at Callaway being evaluated was performed before the new ALARA SDP established the parameters to be monitored.

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Callaway Plant) (ULNRC-4298) to the NRC. The NRC has not yet responded to Union Electric’s argument.

³ NRC Inspection Manual Chapter 0305, paragraph 04.05

⁴ As currently required by 10 C.F.R. § 20.1101(b), and, prior to 1991, suggested by 10 C.F.R. § 20.1(c).

⁵ See, 10 C.F.R. § 50.109(a)(1) (which defines backfitting as “modification of or addition to ... procedures or organizations required to design construct or operate a facility; any of which may result from ... the imposition of a regulatory staff position interpreting the Commission rules that is either new or different from a previously applicable staff position”)

Union Electric understands that the SDP for ALARA resulted from a well-intentioned attempt to establish a metric for inspection of the ALARA programs at nuclear plants. The new Regulatory Oversight Process has made many needed improvements to the inspection and enforcement at nuclear plants and Union Electric strongly supports the effort. Union Electric's experience with the SDP for ALARA, however, suggests that it is inconsistent with the risk-informed basis of the Regulatory Oversight Process and counter-productive to the intent of ALARA.

BACKGROUND ON REACTOR OVERSIGHT PROCESS (ROP) AND ALARA SIGNIFICANCE DETERMINATION PROCESS (SDP)

To understand why Union Electric considers the SDP for ALARA inconsistent with the ROP, it is valuable to describe the origins and goals of the new ROP. On March 9, 1998, the NRC issued SECY-98-045, "Status of the Integrated Review of the NRC Assessment Process for Operating Commercial Nuclear Reactors," which recommended a new integrated assessment process. This process would be based on inspection findings characterized by safety significance that would be scored into performance template areas. Assessment would be based on comparing the totaled scores against a threshold and NRC action taken based on a decision model. In parallel, the nuclear industry, led and coordinated by the Nuclear Energy Institute (NEI), developed an approach that was fundamentally and philosophically different. Industry proposed an assessment process that used high-level, objective indicators in performance areas like maintaining the integrity of barriers to radioactivity release. Each indicator would have thresholds set to form a utility response band, a regulator response band and a band of unacceptable performance.⁶

Based on comments from the Commission, from a public hearing and from a Senate hearing, the NRC staff set out to develop a single set of recommendations for making improvements to the regulatory oversight processes.⁷

On January 8, 1999, the NRC issued SECY-99-007, "Recommendations for Reactor Oversight Process Improvements", which recommended a framework for regulatory oversight with seven cornerstones of safety. Licensee performance that met the objectives and key attributes of each of these cornerstones would provide reasonable assurance that public health and safety were met.⁸ Within each cornerstone, there would be performance indicators and results of inspections that will have risk-informed thresholds. Crossing these thresholds would be based on safety significance and would prompt a need for some NRC interaction.⁹

⁶ SECY-99-007

⁷ SECY-99-007

⁸ SECY-00-0049

⁹ SECY-99-007

On March 22, 1999, the NRC issued SECY-99-007A, "Recommendations for Reactor Oversight Process Improvements (Follow-up to SECY-99-007)," which presented a plan to conduct a pilot of the new assessment process at eight sites.¹⁰ Part of the pilot would test a Significance Determination Process (SDP) which would screen issues identified during inspections to elevate potentially risk-significant issues, to screen out issues of minimal or no risk significance and to trigger more detailed analysis when warranted.¹¹ At that time, the ALARA SDP had not been drafted, but would be completed in time to support the pilot.¹²

A six month pilot was conducted at eight sites between May 30, 1999, and November 27, 1999.¹³ On February 24, 2000, the NRC issued SECY-00-0049, "Results of the Revised Reactor Oversight Process Pilot Program," which recommended implementing the revised ROP, but indicated that further experience with the process is needed. The NRC approved implementation of the revised ROP and termination of the previous assessment process, Systematic Assessment of Licensee Performance (SALP), but noted that this action "will inevitably reveal issues that were not exposed in the pilot program. The [NRC] staff should anticipate that adjustments – perhaps significant adjustments – will be necessary as the program unfolds. As a result, there should be a continuing open dialogue with NRC licensees, other stakeholders, and staff, as issues are encountered."¹⁴

Versions of the Occupational Exposure SDP were issued on August 10, 1999, and November 12, 1999.¹⁵ During the pilot program, the SDP, including the ALARA SDP, was not exercised across the full range of potential inspection findings.¹⁶ On April 21, 2000, the SDP was issued in a finalized form, including the ALARA SDP.¹⁷ Under the current SDP, observations noted during an inspection are evaluated by an initial assessment to determine if it

¹⁰ SECY-99-007A

¹¹ SECY-99-007A

¹² SECY-99-007A

¹³ SECY-00-0049

¹⁴ SRM of May 17, 2000, "Staff Requirements – SECY-00-0049 – Results of the Revised Reactor Oversight Process Pilot Program (Part 2)"

¹⁵ NEI comments on SDP, Attachment 4. These comments noted a need to address clarity of job dose screening criteria and extent of aggregation of multiple green findings to find significance.

¹⁶ SECY-00-0049, Attachment 6

¹⁷ NRC Inspection Manual Change 00-007, issued April 21, 2000.

is a “finding”.¹⁸ Findings are then evaluated by the SDP and Enforcement Review Panel (SERP)¹⁹ in accordance with procedures described in cornerstone specific appendices.

In general, observations are classified as minor issues that can be discussed with the licensee, but do not merit documentation based on inspector judgment.²⁰ If an issue is not considered minor, the issue is analyzed to determine whether it affects a cornerstone. For ALARA issues to be considered to impact a cornerstone, they must satisfy all of three criteria related to the job and the licensee’s average collective dose.²¹ If the issue does not affect a cornerstone (for ALARA issues, not meet any one of the three criteria), then it should normally not be documented, unless evaluated and determined to have extenuating circumstances.²²

For those ALARA issues that are determined to affect a cornerstone, they are sorted into the Green, White, Yellow or Red significance band.²³ A Green finding is one associated with a job where the actual collective dose is less than 25 person-rem, unless there have been three or more such occurrences in the last 18 months. If there have been at least three occurrences, the finding is White. The finding can also be White, if associated with a job where the actual collective dose is greater than 25 person-rem, unless the plant’s current three-year rolling

¹⁸ NRC Inspection Manual Chapter 0609, paragraph 08.02

¹⁹ NRC Inspection Manual Chapter 0609, Attachment 1 is intended to describe the SERP, but has not yet been finalized.

²⁰ NRC Inspection Manual Chapter 0609, Attachment 2. This attachment lists seven questions that can be used by an inspector, in general, to determine if an issue is minor, such as “Could the issue be viewed as a precursor to a significant event?” The attachment also references another appendix for guidance as it “is the most recent information and best examples of what constitutes minor issues.”

²¹ NRC Inspection Manual Chapter 0609, Attachment 2 calls these criteria “Group 2 Questions”. For ALARA issues, the Group 2 Questions are: “(a) Does the actual job dose exceed the projected dose by >50%, AND (b) [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 (c) is the actual job dose > 5 person-rem?”

²² NRC Inspection Manual Chapter 0609, Attachment 2 calls the criteria to determine extenuating circumstances “Group 3 Questions” and lists six, including “Is the finding a violation?”

²³ NRC Inspection Manual Chapter 0609, Appendix C. NRC Inspection Manual Chapter 0305, paragraph 04.05 defines the risk significance associated with each color, ranging from Green (not desirable, very low) through White (low to moderate) and Yellow (substantial) to Red (unacceptable loss of safety margin, high).

average exceeds 340 person-rem (for PWRs) or 600 person-rem (for BWRs). In which case the finding is Yellow. There are no criteria for Red ALARA findings.²⁴

I. THE ALARA SDP IS FATALLY FLAWED AND SHOULD BE SUSPENDED

Audits, inspections and assist visits prior and subsequent to Callaway Refueling Outage 10 identify that Union Electric has a strong ALARA program overall, which is capable of finding and correcting weaknesses in ALARA controls. All of the information set forth in the Notice of Violation was self-identified.²⁵ Also, Union Electric noted the need to upgrade its ALARA performance independent of NRC's inspection findings. Although undesirable, none of the identified areas for improvement in ALARA work practices indicate a potential to exceed individual worker regulatory or licensee administrative exposure limits. Importantly, no worker exceeded individual regulatory or Callaway administrative exposure limits during Refueling Outage 10.²⁶ As such, there is no safety significance to the ALARA practices cited. Higher than desired aggregate occupational exposure should be avoided, but, on its own, does not indicate a problem of any safety significance, much less "low to moderate safety significance" as represented by a White finding.

The SDP for ALARA fails to meet the ROP goals of objectivity, scrutability, focus on risk significance and the reduction of unnecessary regulatory burden. The SDP for ALARA is subjective, inscrutable, less predictable, does not focus on risk significance, and creates a new burden.

The SDP for ALARA effectively creates a "new and different duty" for licensees relating to their radiation exposure control programs. The new requirement for accuracy in dose estimating is "new and different from a previously applicable staff position" without the "systematic and documented analysis" required by 10 C.F.R. § 50.109. In other words, the SDP for ALARA results in an impermissible backfit.

Consistent with the action taken by the NRC for the Fire Protection SDP, the NRC should suspend use of the ALARA SDP until these fatal flaws can be corrected.

²⁴ NRC Inspection Manual Chapter 0609, Appendix C

²⁵ Compare Union Electric's report, *Refuel 10 ALARA Outage Report (October 2, 1999 to November 5, 1999)* issued in June 2000 with NRC Inspection Report 50-483/00-17 of October 4, 2000, and NRC Notice of Violation EA-00-208 of January 9, 2001.

²⁶ Callaway Plant's dose data for 1999, including Refueling Outage 10, shows that no individual exceeded 40 percent of the individual dose limits, greater than 95 percent of individuals receiving measurable dose accumulated less than 20 percent of the limits, and greater than 80 percent of individuals receiving measurable dose accumulated less than 10 percent of the individual limits. No worker exceeded a regulatory limit nor a Callaway administrative limit for dose during Refueling Outage 10. *See also, Occupational Radiation Exposures at NRC Licensed Facilities (1999)*, NUREG-0713, Table 4.6 and Appendix B, page B-2.

A. The Callaway ALARA Program: Strengths and Areas for Improvement

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. The Callaway ALARA program did not change during the period between NRC inspections. Rather, the new NRC metric that was applied for the first time evaluated something entirely different than the inspections had addressed in the past.

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.²⁷ 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.²⁸ These areas for potential improvement were investigated and corrective actions initiated, prior to the August 2000 NRC inspection. The five cited examples of Refueling Outage 10 ALARA work practices identified in the NOV had all been investigated by Union Electric prior to the NRC inspection and corrective action had been initiated where appropriate. The NRC inspection report and NOV do not take issue with any of the corrective actions Union Electric has taken or planned.

During Refueling Outage 10, Union Electric recognized that the execution of work did not maintain aggregate occupational exposure as low as desired and requested assistance from INPO to focus on the ALARA program. The INPO Assist Visit was conducted in January 2000 and a list of actions for consideration was issued by INPO in February 2000. The INPO Assist Visit team proposed actions in seven focus areas, including source term reduction, scheduling and planning, and ALARA process reviews.²⁹ These focus area actions cover the five examples

²⁷ See, *Standards for Protection Against Radiation – Final Rule*, 56 Fed. Reg. 23360 at 23367 (1991), “Compliance with this requirement will be judged on whether the licensee has incorporated measures to track and, if necessary, to reduce exposures and not whether exposures and doses represent an absolute minimum or whether the licensee has used all possible methods to reduce exposures.”

²⁸ See, Union Electric’s report, *Refuel 10 ALARA-Outage-Report-(October 2, 1999 to November 5, 1999)*, issued in June 2000.

²⁹ INPO (Steven L. Driscoll, Manger, Radiation Protection Programs) letter to Union Electric of February 4, 2000.

of Refueling Outage 10 ALARA work practices noted in the NRC NOV of January 9, 2001, almost a year before the NRC issued its NOV. Union Electric developed plans to implement actions in the seven focus areas, which were available for NRC review. The NRC did not raise any issues with the planned actions during the August 2000 inspection.

Union Electric conducted a peer review of the ALARA program at Callaway utilizing personnel from Callaway and three other nuclear power plants for a week in June 2000 and established detailed action plans. The self-assessment focused on incorporation of ALARA into the planning of work, but also touched on daily dose budgeting and incorporation of ALARA into supervisory pre-job briefs. The review generated eighteen Suggestion/Occurrence/Solution (SOS) action documents to address needed improvements.³⁰ This review was completed almost two months before the NRC ALARA inspection. The NRC did not raise any issues with the planned actions during the August 2000 inspection.

A formal root cause evaluation was completed in November 2000, prior to NRC initiating enforcement action. Performance improvements and corrective actions were entered into the Callaway Corrective Action Program. Lessons learned are being incorporated into the planning for Callaway Refueling Outage 11.³¹

The NRC conducted an inspection of the radiation protection activities at Callaway in March 2000 and, with regards to ALARA, noted only that exposure trends were increasing, attributable to increased outage work scope and increased source term from an axial offset anomaly. The NRC inspection reviewed Callaway dose totals and averages for the three previous years. In addition to increased refueling outage work scope, the increasing trend in doses was attributed to a higher source term, which was exacerbated by a reactor fuel condition known as an axial offset anomaly.³² Union Electric actions in response to this anomaly had been previously evaluated by the NRC as conservative and in accordance with regulatory requirements in December 1997.³³ These March 2000 NRC findings are consistent with the May 1998 NRC inspection, which concluded that Union Electric had a very good ALARA program, effectively implemented.

The Callaway ALARA program and performance during Refueling Outage 10 did not change during the period between NRC inspections in March and August 2000. Rather, the new NRC metric that was applied for the first time evaluated something entirely different than the inspections had addressed in the past. It is the ALARA SDP that is fatally flawed and, therefore,

³⁰ Union Electric Report SA00-HP-001, ALARA Work Planning/Support and Radiation Worker Knowledge Self-Assessment dated June 16, 2000.

³¹ See, e.g., AmerenUE presentation on collective radiation dose at Regulatory Conference of November 9, 2000, Slide 25.

³² NRC Inspection Report 50-483/00-07 of March 28, 2000.

³³ NRC Inspection Report 50-483/97-19 of December 18, 1997.

does not provide justification for assigning significance of three white findings to the cited ALARA work practices self-identified by Union Electric.

B. The SDP for ALARA improperly assigns “low to moderate safety significance” to collective occupational doses with no safety significance

This new NRC metric which assigns significance to the failure to achieve all ALARA collective exposure goals, is not consistent with NRC regulatory requirements and past NRC policy. Occupational exposure to radiation has health and safety significance, but the appropriate measure of that significance is dose to the individual worker. To reflect this, the NRC has established limits for the exposure to an individual worker, but no limits for the aggregate exposure to all workers. Although undesirable, none of the Refueling Outage 10 cited ALARA practices indicate a potential to exceed individual worker regulatory or licensee administrative exposure limits. As such, there is no health or safety significance to the ALARA practices noted. Higher than desired or planned aggregate occupational exposure should be avoided, but it does not indicate a problem of any health or safety significance, and certainly not one of “low to moderate safety significance,” unless there is an indication of a potential for individual workers to exceed limits.

When the ALARA rule was revised in 1991, the NRC focus remained on individual exposure within limits. The NRC agreed there would be advantages to establishing a floor, below which efforts to further reduce collective exposure would be left to licensee ALARA programs without NRC oversight.³⁴ At that time, the NRC was evaluating whether the floor should be established for collective exposures at either 100 or 1000 person-rem.³⁵ The new ALARA SDP codes an ALARA finding as White or “low to moderate safety significance” if the associated job is 25 person-rem and exceeds its estimate by 50%, or if at least three jobs of 5 person-rem exceed their estimates by 50%. The licensee must provide dose estimates within 50% for all but two jobs over 5 person-rem and any job over 25 person-rem. In other words, 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 when just 10 years ago collective exposures at least an order of magnitude higher were considered below regulatory concern as long as individual exposure limits were met.

The worker exposures at Callaway during Refueling Outage 10 were properly documented and controlled. Although Union Electric agrees that the aggregate exposures were higher than desired, none of the ALARA practices identified at Callaway indicate the potential for any worker to exceed occupational exposure limits. The relatively small excess exposure that any individual worker received during Refueling Outage 10 is not of any recognized health risk.

³⁴ See, *Standards for Protection Against Radiation – Final Rule*, 56 Fed. Reg. 23360 at 23366 (1991).

³⁵ See, *Policy Statement on Below Regulatory Concern*, 55 Fed. Reg. 27522 (1990).

NRC regulations establish limits for individual occupational exposure and for individual members of the public, not for aggregate population (collective) dose. The ALARA concept is an important part of an adequate radiation protection program. Due to the practice of maintaining radiation exposures ALARA, the average worker's dose is well below limits. This is consistent with the concept of the ALARA regulation as intended to be an operating principle.³⁶ The NRC regulations require that licensees use procedures and engineering controls, to the extent practical, to maintain occupational and public exposures ALARA.³⁷ These regulations require licensees to have and follow a process to minimize exposure, without specifying a particular outcome. Collective dose measurement and assessment is an inexact indicator of the success of a licensee's process unless it is evaluated with judgment and experience.³⁸

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-quantifiable or non-fungible factors, including nuclear safety risk, ALARA goals, and operating or maintenance costs. For example, the ALARA regulations do not establish an equivalency between person-rem and dollars. The NRC has avoided adopting any requirement for a numerical cost-benefit analysis to demonstrate ALARA, as many ALARA procedures reflect sound operating practice which are not suitable for numerical analysis. Furthermore, the cost to conduct the numerical analysis may exceed, in some cases, the value of the dose reduction.³⁹ Any such equivalency could only be a rough guideline to inform decisions and would need to be applied with judgment. The ALARA regulations mandate that the judgments be informed by sound radiation protection principles, but do not mandate a specific result.

The flaw in using a mechanistic screen of average collective dose to determine safety significance is illustrated by the experience at Callaway. The process concludes 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

³⁶ See, *Standards for Protection Against Radiation – Final Rule*, 56 Fed. Reg. 23360 at 23366 (1991), "This shift is to emphasize that the ALARA concept is intended to be an operating principle rather than an absolute minimization of exposures."

³⁷ 10 C.F.R. § 20.1101(b).

³⁸ See, e.g., NRC Inspection Manual, Inspection Procedure 71121, Attachment 2, paragraph 02.06, which 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."

³⁹ See, *Standards for Protection Against Radiation – Final Rule*, 56 Fed. Reg. 23360 at 23367 (1991).

Callaway were a BWR. Callaway currently has a three-year rolling average of annual exposure of 178 person-rem, which exceeds the average for PWR plants (and Union Electric is committed to lowering the average.) In fact, lowering the rolling average was the basis for the 165 person-rem goal established for Refueling Outage 10.⁴⁰ There can be no health or safety significance to the magnitude of Callaway's rolling average, however, as it is less than the 240 person-rem average for BWR plants. The higher total exposures at Callaway compared to other PWRs are traceable, in significant part, to a higher source term due to axial offset anomaly and steam generator work as noted by the NRC in March 2000.⁴¹ Union Electric's decisions to address these potential safety concerns and incur higher aggregate exposures reflect a properly informed judgment. It is a reflection of the success of the ALARA program at Callaway that these exposure totals are not higher in the face of higher maintenance workloads and plant design issues, related to steam generator work and axial offset anomaly, compared to other PWRs. As an illustration, during Refueling Outage 10, Union Electric shifted steam generator maintenance strategy from electrosleeving to plugging for the last two of the four steam generators. This change reduced collective dose for Refueling Outage 10. (Cost and schedule savings were also factors in the decision along with ALARA concerns.)⁴²

Consistent with sound science and past NRC policy, collective dose should not have independent significance under the Occupational Radiation Safety Cornerstone. ALARA findings should be considered significant when they are a precursor indication of potential for exceeding occupational limits. The Performance Indicator for the cornerstone counts events on control of high or very high radiation levels or of unintended individual exposures a significant fraction of limits. This indicator properly focuses on the potential to exceed individual occupational exposure. ALARA inspection findings can also play a role as predictors of potential issues of safety significance when evaluated with judgment. The purely mechanistic approach of the ALARA SDP metric does not accomplish that aim.

C. The SDP for ALARA is subjective, inscrutable, less predictable, does not focus on risk significance and creates new burden

The NRC Strategic Plan establishes that one of the performance goals is zero significant radiation exposures from civilian nuclear reactors.⁴³ Consistent with this goal, the objective of the Occupational Radiation Safety Cornerstone is to ensure worker health and safety from exposure to radiation and this objective is obtained by maintaining worker doses within the NRC

⁴⁰ See, e.g., AmerenUE presentation on collective radiation dose at Regulatory Conference of November 9, 2000, Slide 5.

⁴¹ NRC Inspection Report 50-483/00-07 of March 28, 2000.

⁴² The collective dose for electrosleeving two of four steam generators was 24.3 person-rem, providing an indication of the likely collective exposure reduction for canceling the work on the last two steam generators.

⁴³ SECY-99-007, page 7.

individual exposure limits and ALARA.⁴⁴ As such the objective is to minimize individual exposures, consistent with NRC regulations that establish individual limits.⁴⁵ 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 revised Reactor Oversight Process to improve focus on aspects of licensee performance will not be met.

An ALARA finding that is caused by licensee performance and is related to individual exposure issues could provide advance warning of a potential issue of safety significance. However, a mechanistic application of aggregate exposure totals, does not differentiate between issues that impact individual exposures and those that do not. Simply put, 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. If ALARA issues that cannot be effectively addressed are given the same significance as those that can be, the effectiveness of the Occupational Radiation Safety Cornerstone as an indicator of where NRC attention should be focused will not achieve its purpose.

In addition to differentiating significance to those ALARA issues that are under licensee control, ALARA issues that are not related to an increased risk of individual exposure exceeding limits need to be differentiated from those that do. This significance cannot be determined from a mechanistic evaluation of total job exposure and a given percent over projection. For example, poor practices such as failure to provide appropriate temporary shielding could be a potential contributor to an individual's exposure exceeding limits, if the work was near sources of very high dose rates. Without allowing application of judgment in determining the significance of an ALARA finding, there will be no differentiation between ALARA findings of safety significance and those with no safety significance.

ALARA observations that are classified as minor issues based on inspector judgment do not merit documentation.⁴⁶ Since not all ALARA issues that warrant documentation have a direct or an indirect impact on safety, this presents a conundrum for the inspector, as he cannot document any ALARA issues unless they have impact on safety. The basis for concluding the issues in the August 2000 NRC Inspection Report are of safety significance has not been

⁴⁴ NRC Inspection Manual Chapter 0609, Appendix C.

⁴⁵ Plain language definition of the Cornerstone,
<www.nrc.gov/NRR/OVERSIGHT/ROP/description.html>

⁴⁶ NRC Inspection Manual Chapter 0609, Attachment 2.

adequately documented or justified.⁴⁷ Contrary to NRC guidance, neither the inspection report nor the Final Significance Determination letter provides justification as to why the identified findings are not minor,⁴⁸ nor do they address the alternative perspectives provided by Union Electric under ULNRC-4298, dated August 21, 2000. 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 was that the observations have an actual or credible impact on safety. Given this assumption, Union Electric is concerned that NRC Inspectors will be compelled to conclude that any excess dose over the SDP metric has some impact on safety in order to justify documenting their ALARA observations. This will have an adverse impact on the consistency and validity of inspection reports. The threshold for safety associated with occupational radiation exposure would be established by where each inspector designates an ALARA issue as more than minor. Historically, this has not been the case, as any dose within occupational limits was considered of no health significance. This new interpretation would represent a significant shift in the Staff's position on the significance of collective dose.

The revised ROP established a graded matrix of risk-informed thresholds to assure that safety margins are being maintained and that sufficient time exists for both the NRC and licensees to address noted performance deficiencies before there was an undue risk to health or safety.⁴⁹ The safety significance of an ALARA occupational exposure finding is the potential health risk to the worker from increased exposure. Unless the finding indicates a potential for exceeding individual limits or the ALARA process is significantly malfunctioning, there has been no significant degradation in safety margins. NRC inspection guidance recognizes that the ALARA rule does not require every ALARA effort to demonstrate optimized exposure performance.⁵⁰ Failing to minimize exposure to the extent practical in all cases is undesirable,

⁴⁷ Union Electric previously articulated its position on the lack of safety significance of the ALARA inspection findings in a letter on August 21, 2000 from R. D. Affolter (Manager, Callaway Plant) (ULNRC-4298) to the NRC. The NRC has not yet responded to Union Electric's argument.

⁴⁸ NRC Inspection Manual Chapter 0610* requires an inspection report to have a certain level of detail, which includes in part "...a significance evaluation paragraph that describes the logic for entering the SDP. That is, it answers the pertinent group 1,2 or 3 'thresholds for documentation' questions". This requirement is also referenced in NRC Inspection Manual Chapter 0609, attachment 3, which states "The basis should allow a knowledgeable reader to duplicate the logic that resulted in the staff's significance determination. In cases where the staff is aware of a licensee's alternative perspectives, the staff should give its justification for not accepting the licensee perspectives in the basis discussion."

⁴⁹ SECY 00-0049, page 16.

⁵⁰ NRC Inspection Manual, Inspection Procedure 71121, Attachment 2, paragraph 03.05. See also, *Minor Corrections, Clarifying Changes, and a Minor Policy Change*, 63 Fed. Reg. 39477 (1998), which changed the work "practicable" to "practical" in the ALARA regulation (10 C.F.R. § 20.1101(b)) to remove the basis for an incorrect perception that NRC is requiring

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but it does not indicate a degraded ALARA process if the utility learns from the event and applies appropriate corrective actions.

Besides not meeting the goals of the revised ROP to be more focused on safety, the SDP metric for ALARA has the unintended consequence of making NRC enforcement action more subjective and less predictable. The goals of the revised ROP included making the oversight process more objective, more scrutable and more focused on safety.⁵¹ The SDP for ALARA in practice enhances focus on inspector subjectivity. First, an ALARA issue is subject to screening. During screening, inspector's judgment is allowed only in deciding whether or not an issue is minor or not. Once the inspector has decided an issue warrants being documented, the mechanistic SDP criteria take over. To avoid this conundrum, 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.⁵² Which finding goes in which category could be subject to wide and unpredictable variation between inspectors.

The importance of whether an issue is documented is magnified by the SDP process. 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 as the NRC inspection manual recognizes that ALARA does not require every job to be optimized. 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,⁵³ any ALARA issue documented is likely to be considered of "low to moderate safety significance."

Several unusual results can come from the SDP for ALARA. For example, if a PWR has a rolling three-year average less than 135 person-rem (240 for a BWR), all findings are assigned, "no color", even the most severe ALARA violation. If one programmatic issue, as is the case at Callaway, is associated with more than one job, multiple colors can be assigned to that one

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licensees to use any conceivable dose averting technique, even if the technique is unproven or impractical.

⁵¹ SECY 99-007, page 6.

⁵² See, e.g., *NRC's Color-Coded PI System Still Murky, Says State Regulator*, Inside NRC, page 15 (January 29, 2001).

⁵³ NRC Inspection Manual, Inspection Procedure 71121, Attachment 2, paragraph 02.05.

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.⁵⁴

The SDP does not provide a definition of job,⁵⁵ 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. The licensee cannot anticipate how the inspector will combine or divide up jobs and obtain a consistent and predictable significance between sites or between inspections at the same site. Whether a degraded cornerstone is found depends on what the inspector considers worth documenting and how many jobs he looks at. The unintended consequence is to shift focus to NRC inspection methods and away from licensee performance. For example, Union Electric procedures expect ALARA planning and controls to be implemented at the Work Authorizing Document (WAD) level.⁵⁶ The NRC considers that the

⁵⁴ SECY 00-0049, attachment 9 (*Assessment Process*) pages 1 and 2, which identifies that one event, a reactor trip, should be evaluated as one White finding, even though it is counted under two categories within a cornerstone.

⁵⁵ See, NRC letter to Union Electric of January 9, 2001, which states, "We recognize that the term 'job' is not formally defined by the SDP and it's supporting guidance. ... [T]he term 'jobs' in the SDP clearly corresponds to those work activities for which distinct ALARA planning and controls are implemented."

⁵⁶ In support of Union Electric's position, their work instructions and notes included in the WAD are to consider ALARA concerns, such as:

- Component removal to a low dose area.
- Prefab work outside the RCA.
- Part or component replacement, rather than repair, in areas with significant radiation levels.
- Mockup training.
- Component and/or WAD history review to determine lessons learned that may be included in the work instructions, or need further follow-up by the shop or planner prior to working the job.
- Job site walk downs to identify problems or work site interferences.
- Include information in work instructions for "Troubleshoot" WRs that minimize worker time in Radiation Areas.
- Items such as prints, location drawings, vendor manual excerpts, information regarding work history, and suspected problems.

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definition of job is at the Radiation Work Permit (RWP), inconsistent with the intent of Union Electric's procedures for ALARA planning and control at Callaway.⁵⁷ Union Electric does not disagree with the NRC observation, and considers planning at the RWP level a part of its practice. Shifting more planning to the WAD level is one of the corrective actions Union Electric desires to implement. Union Electric is concerned that the further improvement by the nuclear industry toward achieving ALARA will be hampered by the subjective and unpredictable interpretations adopted during NRC inspections.

D. The SDP for ALARA creates a new and different duty on licensees for their radiation exposure control programs.

Administratively, the SDP is nothing more than guidelines for NRC Inspectors. In practice, the SDP creates a new duty on licensees, as they strive to comply with ALARA regulations. The ALARA NOV at Callaway is coded with a safety significance of three White findings, since there were several RWPs that exceeded the SDP mechanistic guidelines for total job exposure and percentage over estimates. Focusing enhanced enforcement attention on this issue can only dilute regulatory attention from issues with safety significance and engender baseless worker concerns over the health effects of small individual exposures. The significance of an ALARA finding should be determined considering corrective actions taken by the licensee. Further, the focus should be on licensee performance. The SDP should consider whether factors beyond the licensee's control, like plant design problems and unique maintenance needs, contribute to the above average performance. The SDP, by providing for enhanced enforcement without considering mitigating factors, like licensee corrective actions and without focusing on licensee performance, brings a new and arbitrarily higher significance to ALARA deficiencies. This radical shift in enforcement priorities for ALARA is not justified by the previous 30-year success of the ALARA regulations.

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- Work locations listed on the WAD should be correct. A map or drawing and ALARA or Surrogate Tour photos should also be included in the WAD, when available.

In addition to the instructions provided to the discipline planners, the Rad/Chem Planner and station ALARA personnel also review each Work Authorizing Document prior to placing it into the Health Physics computer system. This is a second level review of the Work Authorizing Document to consider any additional ALARA planning and controls that may be desired. Consequently, a "job" at Callaway Plant is the Work Authorizing Document as all ALARA planning starts at this level in the organization.

⁵⁷ NRC letter to Union Electric of January 9, 2001, which states, "from our review of your procedure PDP-ZZ-00003, 'Work Document Planning,' Rev. 28, and your conduct of in-progress job and post-job reviews required by procedure HTP-ZZ-01102, 'Pre-Job ALARA Planning and Briefing,' Rev. 14, 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".

Assigning a “low to moderate safety significance” to the ALARA NOV is not justified if the mitigating factors involved are considered. For example, as discussed above, the ALARA issues documented in the NRC inspection report had been found previously by Union Electric at Callaway. The NRC did not identify any deficiencies in Union Electric’s planned corrective actions, which indicates that licensee action to improve ALARA performance without extra attention from Region IV should be adequate.

Previously, no ALARA NOVs were issued, but the enforcement policy stated that the failure to maintain and implement a program was a level IV violation (lowest of four levels). The new ALARA SDP metric would require one aspect of ALARA process, exposure estimating, to be executed almost perfectly to avoid White findings. Putting ALARA budget adherence on the same safety footing as plant safety work is an unprecedented involvement by the NRC in licensee operating discretion. Barrier integrity improvements could be delayed, to reduce plant rolling average and avoid the chance of White ALARA findings. Any PWR with a rolling three-year average over 340 person-rem or BWR over 600 would be encouraged to avoid scheduling 25 person-rem jobs to avoid a chance of an ALARA finding assigned Yellow significance. The significance associated with the Callaway ALARA NOV should reflect the importance of preserving the spirit, not just the letter, of maintaining licensee discretion in plant operations where appropriate.

- E. As implemented by the NRC Staff, the SDP for ALARA is “new or different from a previously applicable staff position” without the “systematic and documented analysis” required by 10 C.F.R. § 50.109.**

ALARA has worked well over the past 30 years by relying on licensee-managed procedures. Converting ALARA enforcement from ensuring there is an effective process “based on sound radiation protection principles” (as required by 10 C.F.R. § 20.1101) to requiring quantified, outcome-specific, aggregate exposures is a “new or different” position from “a previously applicable staff position.”⁵⁸ This new position has not been justified under the required analyses for backfits.

The ALARA program at Callaway had been consistently evaluated as a strong, effectively implemented program. After the implementation of the SDP for ALARA in April 2000, the August 2000 NRC Inspection found three White findings of “low to moderate safety significance,” which Union Electric considers unjustified. The examples of ALARA work practices warranting improvement were not of safety significance per accepted science or past NRC policy. It is the subjective and unpredictable criteria of the SDP for ALARA that lead to this surprising result. Licensees now have a new and different duty to provide precise dose estimates or face escalated enforcement.

⁵⁸ 10 CFR § 50.109

The consequence of assigning a new and arbitrarily higher significance to ALARA issues is a *de facto* backfit resulting solely from the implementation of the ALARA SDP.⁵⁹ Licensees are now required to maintain dose projections in a way that is almost completely specified by the NRC regarding the activities covered, the method and justifications for revisions, and the tracking and documentation required, in order to have an “accurate” assessment from the NRC. The licensee’s discretion is restricted to managing the ALARA program within the constraints specified or implied by the SDP. The result being that ALARA planning and controls implementation methodologies have been specified by the NRC (through the SDP) without regard for how the licensee wishes to implement the program. Regarding the current situation at Callaway, the NRC has effectively relieved the Union Electric staff of its ability to manage the ALARA program in the most effective and efficient manner suited to its organizational structure and philosophies. Specifically, the net effect at Callaway is that the site-wide organization has been relieved of its responsibility for managing ALARA and that responsibility has been shifted squarely to the formal ALARA review process, which is solely the responsibility of the health physics staff.

The NRC has not conducted a systematic and documented analysis to justify the imposition of the new duty on licensees, effectively restricting the amount of work the licensee can perform at any PWR to that which results in no more than 135 person-rem, on average, per year.⁶⁰ Any work scope that results in a higher average exposure and results in excess collective exposure on any exposure on the order of magnitude of 10 person-rem, exposes the licensee to liability for a degraded occupational safety cornerstone. There are potential negative implications for safety-related maintenance and upgrade work if licensees defer those activities to fall within the ALARA SDP metric. It is this type of undisciplined change with potential far-reaching consequences that the NRC was trying to avoid in revising the backfit rule.⁶¹

⁵⁹ See, *Revision of Backfitting Process for Power Reactors*, 50 Fed. Reg. 38097 at 38101 (1985), which states, “there is no practical difference between a backfit that is imposed pursuant to a rule or a staff position.”

⁶⁰ To avoid the potential for ALARA issues to impact a safety cornerstone, PWR licensees must not exceed 135 person-rem under NRC Inspection Manual Chapter 0609, Attachment 2. BWR licensees are allowed a higher average. There is no principled reason to expose BWR workers to collective doses higher than PWRs. The SDP for ALARA establishes a rough distinction between two classes of reactors, but allows no fine distinction for site specific differences.

⁶¹ See, *Revision of Backfitting Process for Power Reactors*, 50 Fed. Reg. 38097 at 38101 (1985), which states, “changes in ... staff positions for procedures and organizations should also be analyzed before implementation to determine, inter alia, the safety significance of any such proposed change.”

Conclusion: The new SDP for ALARA is fatally flawed and should be suspended

The new ALARA SDP as implemented is fatally flawed as it assigns an inappropriate level of significance to imperfections in estimating and executing work. Union Electric executed about 3000 jobs during Refueling Outage 10. The NRC recognizes that the ALARA regulations do not mandate that collective exposure for all work be the absolute minimum. 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 Union Electric for having an aggressive ALARA program that finds and implements improvements in ALARA work practices.

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 was no health or safety impacts of the identified deficiencies relating to ALARA controls. The areas for improvement in ALARA controls that Union Electric identified at Callaway were not desirable and Union Electric has taken aggressive action to correct them. Nevertheless, they simply do not represent any safety significance.

The SDP for ALARA actually creates a new regulatory requirement – dose estimates for radiation work permits must be accurate. There are potential negative implications for safety-related maintenance from establishing an effective ceiling on work of 135 person-rem per year. The SDP for ALARA is an impermissible backfit.

Consistent with the action for the Fire Protection SDP,⁶² the NRC should suspend use of the ALARA SDP until these fatal flaws can be corrected.

II. THE SDP FOR ALARA WAS INCORRECTLY AND RETROSPECTIVELY APPLIED AT CALLAWAY SO THAT THE NRC STAFF'S SIGNIFICANCE DETERMINATION IS INCONSISTENT WITH THE APPLICABLE SDP GUIDANCE.

Even if the NRC were to disagree with the foregoing discussion regarding the fatal flaws in the ALARA SDP, Union Electric disagrees with its application at Callaway. It was inappropriately and unfairly applied retroactively and it was applied incorrectly in a manner inconsistent with the applicable SDP guidance. The NRC found only one violation at the Callaway plant, that the licensee did not use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses as low as reasonably achievable during Refueling Outage 10. Since Refueling Outage 10 was planned and conducted a year before the ALARA SDP was issued, it violates any notion of due process

⁶² See, SECY-00-0049, which discusses the need to upgrade several SDPs prior to initial implementation, including the Fire Protection SDP which had already been issued. See generally, history of implementing the Physical Protection SDP (which based on Union Electric's knowledge and belief was also suspended).

and fairness to apply the ALARA SDP to a finding from that outage; therefore, the violation should be considered a “no color” finding. In the alternative, even if the ALARA SDP is applied retroactively, it should be applied in its current form only once to the one violation, and find the significance as one “no color” finding. This result is achieved by assigning significance of an appropriate aggregate exposure for Refueling Outage 10 or by evaluating the unnecessary exposure associated with each of the five examples of Refueling Outage 10 ALARA work practices listed in the violation. Applying the ALARA SDP to six Radiation Work Permits (RWPs) from Refueling Outage 10 incorrectly implies that any RWP involving over 5 person-rem that exceeds its original estimate by 50% is a “finding,” contrary to the definition of “finding” in the NRC Inspection Manual. In addition, applying the definition of job at the RWP rather than Work Authorizing Document (WAD) level is inconsistent with the intent of Union Electric’s procedures for ALARA planning and control at Callaway.

A. Retroactive application of the new ALARA SDP to Refueling Outage 10 is inappropriate and unfair

Applying the ALARA SDP metric for planning performance to Refueling Outage 10 at all is an impermissible retroactive application of an enforcement policy, even if the ALARA SDP were not suspended as we recommend. The SDP represents an impermissible new or different NRC staff position on ALARA,⁶³ as previously there was no regulatory significance to job exposure estimates that were unrealistically low. Past NRC inspection policy sought to ensure that exposure estimates did not become inflated.⁶⁴ The ALARA SDP reflects a new policy of requiring exposure estimates to be accurate. This policy was applied to Callaway Refueling Outage 10, even though the SDP had not been issued prior to the outage and Union Electric had no notice of this change in policy at the time of its ALARA planning.⁶⁵

A previous NRC inspection of Callaway and the prior history of NRC enforcement established ALARA violations as low safety significance. The NRC inspection at Callaway in

⁶³ See, 10 C.F.R. § 50.109(a)(3) (which limits backfitting to only when, with regard to the overall protection of public health and safety or the common defense and security, there is either a finding of necessity or documented analysis showing a substantial increase in protection justifying the costs to implement.)

⁶⁴ See, e.g., NRC Inspection Manual, Inspection Procedure 71121, Attachment 2, paragraph 02.06.a and b, which emphasizes that job exposure estimates should be verified as reasonable by comparison with past site-specific experience, industry data, and actual exposure results.

⁶⁵ The NRC letter of January 9, 2001, acknowledges that the performance associated with these findings occurred prior to the implementation date of the revised ROP, but that the ALARA SDP is to be applied to inspection reports completed after April 1, 2000, under the guidance for the ROP initial year implementation. This guidance was issued in February 2000, six months after Refueling Outage 10 was completed. At the time Union Electric planned and executed the outage, it had no notice that its collective exposure estimates and returns would be subject to scrutiny under a different standard.

March 2000 with regards to ALARA noted only that exposure trends were increasing, attributable to increased outage work scope and to a higher source term, which was exacerbated by a reactor fuel condition known as an axial offset anomaly.⁶⁶

Under the NRC Enforcement Policy, ALARA violations are Level IV, while White findings indicate a significance equivalent to Level III. White findings under the revised ROP require a response comparable to that required for Level III violations under the enforcement policy. If Union Electric had known the revised importance of using precisely accurate estimates, it would have taken actions to update the estimates during Refueling Outage 10. Instead, 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 magnify the problem areas of ALARA adherence in work execution at Callaway.⁶⁷

The estimates used by Union Electric for Refueling Outage 10 were appropriate for ALARA purposes. They were aggressive estimates, and their effectiveness as tools to spark investigations to discover less than optimum implementation of ALARA work practices was enhanced by being somewhat unrealistic, as they were not adjusted for higher than expected dose rates. Since the estimates were aggressive, more jobs were investigated for potential improvements to ALARA practices. The effectiveness of this process is illustrated by the number of issues noted during the INPO and peer reviews conducted following Refueling Outage 10 and the number of improvement actions developed for implementation.

In 1991, when the ALARA regulation was revised from a hortatory suggestion to a mandatory requirement, the NRC noted that maintaining the emphasis on ALARA as an operating principle should reduce potential problems in retrospective evaluation of licensee performance.⁶⁸ The new ALARA SDP reverses course and no longer maintains focus on whether there is a program to conduct ALARA reviews and efforts made to achieve ALARA. Instead, the new ALARA SDP focuses on whether specific exposure returns are achieved compared to pre-job estimates. It was this sort of retroactive enforcement of a mandate to ensure the absolute minimization of exposures that the NRC was trying to avoid in its adoption of 10 C.F.R. Section 20.1101 as a final rule.⁶⁹ Consistent with Commission precedent and due process

⁶⁶ NRC Inspection Report 50-483/00-07 of March 28, 2000.

⁶⁷ Union Electric letter from R. D. Affolter (Vice President, Nuclear) (ULNRC-4343) to the NRC of November 16, 2000, Attachment 1, page 8.

⁶⁸ *Standards for Protection Against Radiation – Final Rule*, 56 Fed. Reg. 23360 at 23367 (1991).

⁶⁹ *See, Standards for Protection Against Radiation – Final Rule*, 56 Fed. Reg. 23360 at 23366 (1991), which states in response to comments about problems in the retrospective evaluation of licensee performance by NRC inspectors, “The emphasis on ALARA actions has been revised from detailed requirements to document all ALARA actions to a requirement to have a radiation protection program that includes measures to keep doses and intakes ‘as low as is reasonably achievable.’ This shift is to emphasize that the ALARA concept is intended to be

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in implementing administrative changes,⁷⁰ even if the ALARA SDP is to be applied, it should not be applied to work planned and executed before it was issued.

If the ALARA SDP were not applied to the Callaway ALARA NOV, the NOV would certainly be assigned one finding of “no color”. This designation appears appropriate for the first ALARA NOV ever issued. Attachment 2 to NRC Inspection Manual 0609 states that an issue will be documented as a “no color” finding in those cases involving extenuating circumstances.

B. Even if the SDP for ALARA were to be applied retroactively to Refueling Outage 10 at Callaway, significance should be based on Union Electric’s performance on the entire outage.

If the ALARA SDP were to be applied retroactively to the Callaway ALARA NOV, it should be applied programmatically and conclude there was one “no color” finding. One example of an aggregate measure is that Refueling Outage 10 had a 210 person-rem budget that was exceeded by 47 person-rem, which is the most exposure attributable to ALARA work practices and is not more than 25% over budget. In accordance with the SDP for ALARA, the result is a “no color” finding, as the applicable group 2 question from Attachment 2 to NRC Inspection Manual 0609 would be answered that the actual job dose does not exceed projected dose by greater than 50%. The NRC states that during Refueling Outage 10, the licensee did not achieve ALARA, “as [Union Electric] originally estimated that plant workers would receive exposures totaling of 165 person-rem during Refueling Outage 10. The actual value received was 305 person-rem ... a significant portion of the increase was attributable to poor ALARA work practices.”⁷¹ As the violation is for the entire outage, the significance of the violation

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an operating principle rather than an absolute minimization of exposures.”

⁷⁰ Retroactivity is defined as the taking away or impairing of vested rights acquired under existing law, or creating a new obligation, imposing a new duty or attaching a new disability in respect to transactions or consideration already past. (*Association of Accredited Cosmetology Schools v. Alexander*, 979 F.2d 859, 864 (D.C. Cir. 1992)). In this matter, the ALARA SDP creates a new duty of accuracy in dose estimating and assigns a new disability, enhanced enforcement, to degraded ALARA work practices. “Retroactivity is not favored in the law. Thus congressional enactments and administrative rules will not be construed to have retroactive effect unless their language requires this result.” (*Bowen v. Georgetown University Hospital*, 488 U.S.204, 208 (1988)). “Retroactive impositions of civil liability are conceptually of a piece with *ex post facto* criminal laws,” and the court finds the reordering of affairs inherently repugnant (*Ralis v. RFE/RL, Inc.*, 770 F.2d 1121, 1126 (D.C. Cir. 1985)). *But see*, other cases have held that retroactivity is to be assumed unless otherwise stated when lower court decisions are reviewed on appeal, *see, e.g., Bradley v. Richmond School Board*, 416 U.S. 696, 711 (1974) which states that “a court is to apply the law at the time it renders its decision.”

⁷¹ NRC letter to Union Electric of January 9, 2001.

should be based on an aggregate measure of Union Electric's performance during the outage, not by selectively analyzing performance on a few jobs from the 3000 completed during the outage.

The NRC Significance Determination incorrectly identifies that Union Electric 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 at the start of the Refueling Outage was 210 person-rem.⁷² Holding Union Electric accountable for the 165 person-rem goal for the outage improperly establishes a precedent that would restrict Union Electric's ability to establish challenging management goals for a refueling outage before actual estimates and planning take place.

Whether "job" is defined as a RWP or a WAD, the aggregate of those estimates for Refueling Outage 10 at Callaway was 210 Rem. For determining the significance of an ALARA finding, the SDP relies on determining the total dose and percent increase over estimate of the job associated with the finding. 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 Refueling Outage 10, either of these sums was 210 person-rem.

It is also appropriate, in evaluating Union Electric's ALARA performance during Refueling Outage 10, to adjust the original estimate by 25% for higher dose levels than expected during exposure estimating. Dose rate levels were found during the entry to be 25 to 50% higher than the dose rate levels expected during planning. Using only the lower value of 25% would account for 35 person-rem of the increase over the 210 person-rem budget.⁷³ 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. Therefore, the amount of the exposure increase attributable to higher dose rates should not be considered in determining the significance of the finding.

Emergent work during Refueling Outage 10, 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.⁷⁴ This emergent work should not be considered in determining the significance of the ALARA NOV as it would establish an undesirable precedent that emergent work cannot be added to an outage without deleting other work or risking enforcement action.

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% of the 210 person-rem budget). Excess exposure of about 25% supports Union Electric's analysis that there

⁷² Union Electric presentation at November 9, 2000, regulatory conference, Slide 5.

⁷³ Union Electric presentation at November 9, 2000, regulatory conference, Slide 5.

⁷⁴ Union Electric presentation at November 9, 2000, regulatory conference, Slide 5.

is a strong ALARA program, but there is need for improvement in ALARA execution. As such, assigning the NOV a significance of “no color” rather than three White findings would be appropriate.

C. In the alternative, significance could be based on Union Electric’s performance during Refueling Outage 10 by analyzing representative jobs.

In the alternative, even if the NRC decided to evaluate selected jobs from Refueling Outage 10 and use analysis of them as a measure of the significance of the ALARA NOV, the jobs selected were not appropriately analyzed. The NRC assessed the significance of performance on 6 RWPs, which were not causally related to the five examples of ALARA work practices listed in the NOV and which do not reflect that Callaway procedures intend that the WAD be the lowest level of ALARA planning.

The NRC Inspection Manual identifies that exposure returns over 50% of estimate on 5 person-rem jobs is a good screen to focus inspection. The SDP then inappropriately translates these screening criteria into a color significance decision tree that makes the mere existence of such jobs a finding. NRC Inspection Manual chapter 0609-04 defines a finding as any detail noted during an inspection that has been placed in context and initially determined to be of sufficient potential significance to warrant more detailed review using the SDP. In order 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.

The NRC identified in the NOV five examples of work practices not resulting in ALARA collective doses during Callaway Refueling Outage 10. Any numerical criteria to determine significance should be on jobs associated with those examples. Instead, the NRC significance determination process analyzed four RWPs that involved total exposure over 5 person-rem and 2 RWPs that were over 25 person-rem. As all six RWPs had an increase of over 50% compared to original estimates, the NRC determined the significance as 3 white findings. If the significance had been determined for each RWP based on the amount of the excess exposure attributable to the examples of degraded ALARA work practices noted in the NOV, the conclusion would have been findings with “no color”, as follows:

- Planning and conducting maintenance near RCS and steam generator drains earlier in outage than in the past and not filling steam generator secondary sides were examples of degraded ALARA work practices.⁷⁵ They were associated with four RWPs. The NRC inspection report notes that this was only a 25% factor on exposure increase.⁷⁶

⁷⁵ NRC Notice of Violation EA-00-208, examples a, b, and c.

⁷⁶ NRC Inspection Report 50-483/00-17 of October 4, 2000, enclosure Section 2OS2.b.

- Conducting insufficient mock-up training was an example of a degraded ALARA work practice.⁷⁷ It was associated with three RWPs. The actual fraction of excess exposure attributable to this example is not clear, but it could not have been a 50% factor on exposure.⁷⁸
- Ineffective communications between Union Electric and the primary contractor was an example of a degraded ALARA work practice.⁷⁹ It was associated with two RWPs. The actual fraction of excess exposure attributable to this example is not clear, but it could not have been a significant factor on exposure.⁸⁰

⁷⁷ NRC Notice of Violation EA-00-208, example d.

⁷⁸ NRC Inspection Report 50-483/00-17 of October 4, 2000, enclosure Section 2OS2.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 manhours for the work could have been avoided by mock-up training would there be a 50% 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 manhours compared to 300-350 normally, (about 50%) 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 manhours for this first large scale application of electrosleeving were difficult to estimate what expected manhour performance should have been. The manhours for eddy current work was about twice previous experience, but this was less than half the work so could not be more than a 50% factor on exposure. Pages 12 and 15 note that RWP 99-53324 was for health physics support and that the manhour growth for this RWP was about 62%, primarily, but not solely due to growth in the steam generator work.

⁷⁹ NRC Notice of Violation EA-00-208, example e.

⁸⁰ NRC Inspection Report 50-483/00-17 of October 4, 2000, enclosure Section 2OS2.b, identifies the two RWPs as 99-53324 and 99-53022. Union Electric, *Refuel 10 ALARA Outage Report (October 2, 1999 to November 5, 1999)* issued June 2000, pages 12 and 15 note that RWP 99-53324 was for health physics support, the manhour growth for this RWP was about 62% and, although poor communications were a factor, the increase was primarily due to growth in the steam generator work. Page 16 notes that RWP 99-53022 was for foreign object removal from the steam generator secondary side. The higher exposure was due to higher work scope, as more objects needed to be removed. Although communication systems could be improved, communications during Refueling Outage 10 was better than past experience due to incorporating lessons learned.

- One RWP, reactor coolant pump seal removal and replacement, was not associated with any of the examples in the NOV,⁸¹ but it was still factored in for significance determination.

Thus, an analysis of the exposures relating to the five examples cited in the NOV results in findings with “no color.”

D. Even if use of the SDP for ALARA is considered retroactively applicable to Refueling Outage 10 at Callaway and even if the SDP is applied to jobs without being related either to the scope of the NOV or the issue raised in the NOV, the ALARA SDP metric should be applied to jobs as defined by WADs at Callaway, not to the RWPs.

The NRC applied the SDP for ALARA at the RWP level as that was thought to be the lowest level where ALARA planning was conducted.⁸² Since the NRC NOV was based on examples of allegedly deficient conduct of work, it is an error to determine the significance of the NOV based on the conduct. The controlling factor to define what is a job should be what Union Electric’s procedures intend to be the lowest level. The procedures, which were not criticized in the NRC inspection report, intend the lowest level of ALARA planning to be the WAD.

Under this analysis, Union Electric considers that the proper result should be one finding of “no color.” In evaluating this contention, the NRC should consider the following ways in which the ALARA SDP overstates the significance of the finding:

- High three-year rolling average is only indicative of possible occupational exposure control issues and not conclusive proof. As discussed above, the reasons that Callaway’s three-year rolling exposure average exceeds other PWR’s is due in large part to plant design issues and the maintenance strategies selected. NRC IM Chapter 0609, attachment 2 asks the question whether the three-year rolling average collective dose is above average. If the answer was tempered with judgment, the conclusion should be, “yes, but not above ‘average’ for a plant with axial offset anomaly and old Westinghouse

⁸¹ NRC Inspection Report 50-483/00-17 of October 4, 2000, enclosure Section 2OS2.b, identifies that due to an emergent change to the scope, all reactor coolant pump seals could not be worked with the steam generator’s secondary sides full as originally planned. Workers moved tooling between pumps multiple times as other work allowed seal work to proceed. Neither of these points is identified as poor ALARA work practices in the NRC Notice of Violation. Arguably, the Inspection Report is not listing deficiencies, but only documenting the complexity associated with accomplishing multiple jobs to ensure the integrity of the Reactor Coolant Boundary.

⁸² NRC letter to Union Electric of January 9, 2001.

Inconel 600 tubes in its steam generators". The result under the attachment, with no other considerations, would then be that the finding has "no color".

- Callaway has a strong ALARA program, to identify degraded performance and establish corrective actions for exposure control, as shown by strong upchecks from peer reviews and past NRC inspections. If the SDP considered the mitigating value of licensee corrective actions, like the enforcement policy itself does,⁸³ then the improvement actions initiated by Union Electric should reduce the significance associated with the NOV.
- Previously, the only consequence attached to over aggressively low dose estimates was economic, as it would lead the licensee to conduct additional investigations for poor ALARA work practices. It overstates the significance determination of the NOV to not take into account that Union Electric, during Refueling Outage 10, made a conscious decision to spend additional effort on investigating the causes of dose overruns and not on correcting the unrealistic dose estimates.

If "job" is defined at the WAD (not RWP) level at Callaway, then there are five jobs that exceeded 5 person-rem, but none that exceeded 25 person-rem.⁸⁴ As discussed in the R. D. Affolter letter dated November 16, 2000, the significance attributable to having five 5 person-rem jobs exceed their dose estimates by over 50% is one White finding. However, after careful reflection on the implementation of the ALARA SDP, Union Electric now believes that a "no color" finding is appropriate. The different ways of looking at the same fact pattern and of concluding different enforcement significance highlight the problems with the SDP metric as adopted.

III. THE USE OF THE SDP FOR ALARA SHOULD BE SUSPENDED UNTIL IT CAN BE REVISED TO BE CONSISTENT WITH GOALS OF THE REVISED ROP AND WITH GOALS OF ALARA

SECY-00-0049 noted that the feed-back from the pilot programs to implement the revised ROP indicates that further experience is needed with the revised process. It also noted that the fire protection SDP needed to be revised to reduce its complexity and improve its usability prior to initial implementation. Consistent with the action taken for the fire protection SDP, the NRC should suspend use of the ALARA SDP until improved determination methodology for ALARA findings can be developed. The current ALARA SDP produces significance determinations that overstate the significance of the findings and do not account for appropriate consideration of licensee identification and mitigation actions.

⁸³ See, SECY-00-0061, page 2, which discusses mitigation discretion under the Enforcement Policy and notes that the Enforcement Policy has been modified so that mitigation discretion for some circumstances does not normally apply to violations associated with issues evaluated by the SDP.

⁸⁴ Letter dated November 16, 2000, from R.D. Affolter, Vice President, Nuclear, Union Electric Company, to the U.S. Nuclear Regulatory Commission (ULNRC-4343).

ALARA has operated successfully for 30 years. The ALARA SDP now creates new criteria, which can lead to White findings at almost every ALARA inspection. This result will not lead to increased focus on significant safety issues as intended by the new ROP, but rather, the focus will be ALARA findings. Since there is no screening of significance in the ALARA SDP for whether there is a risk of exceeding individual exposure limits, the revised ROP may result in focus on ALARA findings of no health or safety significance. Collective exposures criteria of 5 or 25 Rem per job and three-year rolling averages for PWR and BWR are acceptable screens for the NRC inspection procedures to focus reviews but should not be used to define the safety significance of ALARA findings. Also, the ALARA SDP does not provide mitigation of significance for licensee self-determination or prompt and effective corrective actions. Since the collective exposure results are only one potential indication of how the licensee's ALARA process is working, effective action to prevent recurrence should be a key part of determining the significance of an ALARA issue.

A fatal flaw in the ALARA SDP is that it assumes a healthy ALARA program. If dose estimates are invalid for a job, the SDP provides no correct way to assess significance of findings. Significance based on planning performance, which although key, is only one of numerous aspects of ALARA program inspection procedure. By overstating the importance of one element of the ALARA program, the SDP threatens to force licensee's ALARA programs out of balance.

The use of the SDP for ALARA should be suspended as it is fatally flawed. Union Electric understands that the SDP for ALARA resulted from a well-intentioned attempt to establish a metric for inspection of the ALARA programs at nuclear plants. The new Regulatory Oversight Process has made many needed improvements to the inspection and enforcement at nuclear plants and Union Electric strongly supports the effort. Union Electric's experience with the SDP for ALARA, however, demonstrates that it is inconsistent with the risk-informed basis of the Regulatory Oversight Process and counter-productive to the intent of ALARA. Consistent with suspending the use of the SDP for ALARA until lessons learned are incorporated, the significance of the ALARA NOV issued to Callaway should be assessed as "no color."