

**Nuclear Regulatory Commission Staff Audit of the Calvert Cliffs Unit 3 Chapter 12,
Radiation Protection, Construction Worker Dose Calculations to Demonstrate
Compliance with 10 CFR 20.1301 and 10 CFR 20.1302**

Audit Summary

INTRODUCTION

The Nuclear Regulatory Commission (NRC) staff conducted an audit of the Calvert Cliffs Nuclear Power Plant Unit 3 (CCNPP3) construction worker dose calculations to demonstrate compliance with 10 CFR 20.1301 (Dose limits for individual members of the public.) and 10 CFR 20.1302 (Compliance with dose limits for individual members of the public.). The audit was conducted over several days in March and April of 2013. The staff conducted the audit by reviewing the applicant's calculations via the applicant's electronic reading room. The staff focused its review on the most recent calculation submitted by the applicant (calculation number 32-7012294-003).

OBJECTIVES

The objective of the audit was to review the applicant's calculations and their assumptions used in estimating the dose rates received to construction workers of CCNPP3 as a result of the operation of the nearby Calvert Cliffs Units 1 & 2.

BACKGROUND

CCNPP3 construction workers are considered members of the public. This means that they will not be trained as radiation workers in accordance with 10 CFR 19.12. Therefore, the dose limits to individual members of the public applies to these workers (those limits provided in 10 CFR 20.1301), instead of the dose limits to radiation workers (those limits provided in 10 CFR 20.1201).

The initial estimated construction period of CCNPP3 was between 2010 and 2015. In Request For Additional Information(RAI) 354, Question 12.03-12.04-10, the staff requested that the applicant update their construction worker dose estimates in the CCNPP3 final safety analysis report(FSAR) because the previous estimated construction period for CCNPP3, from 2010 through 2015, was no longer realistic. The staff believed that construction worker dose estimates would change with a delayed construction time frame because additional loading to the Calvert Cliffs Units 1 & 2 independent spent fuel storage installation (ISFSI) would occur.

Therefore, in the initial response to RAI 354, Question 12.03-12.04-10 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12270A322), the applicant assumed that the Calvert Cliffs Units 1 and 2 ISFSI would be filled for the entire CCNPP3 construction period and updated their construction worker dose estimates accordingly. This approach was acceptable because it assumes the highest dose rates possible from the ISFSI. However, staff had questions regarding the estimated construction worker dose rates provided in the applicant's response and the proposed FSAR markup. Therefore, the staff audited the applicant's revised construction worker dose calculation package in order to ensure compliance with 10 CFR 20.1301. The audit results are documented within this audit report.

AUDIT ACTIVITIES

During the audit, the staff focused their review on the applicant's construction worker dose calculations and assumptions for meeting the criteria of 10 CFR 20.1301, 10 CFR 20.1302, and Regulatory Guide (RG) 1.206. The staff primarily focused their review of the applicant's calculations on the annual dose to the construction worker likely to receive the highest dose from activities associated with the operation of Calvert Cliffs Units 1 & 2 and ensuring that this construction worker would not receive a dose in excess of 100 mrem/year or 2 mrem in any one hour, as required by 10 CFR 20.1301.

Upon reviewing the applicant's initial calculations, the staff did not fully understand how the applicant calculated the dose to the maximum construction worker. As a result of staff's questions, the applicant revised their calculations. The revised calculations were provided in calculation number 32-7012294-003.

In this calculation, the applicant calculated a maximum dose rate from the ISFSI of 55 mrem per working year (2200 hours). This dose rate was calculated on a road north of the ISFSI. Finally, the applicant estimated that a worker spending 4 percent (88 hours) of his time near the highest dose contour (close to the ISFSI fence), could receive a dose of up to 7 mrem during that time period.

However, the applicant's calculation package acknowledges that there are uncertainties in future loading of the ISFSI and Resin Storage area and uncertainties about construction worker occupancy in areas. Therefore, the applicant acknowledges that in order to adhere to the 100 mrem/year limit they will not only have to rely on reasonable projections, but also on the Calvert Cliffs Unit 1 & 2 as low as reasonably achievable (ALARA) program.

OBSERVATIONS

After reviewing the calculation package, the staff was concerned that there is a potential for an individual construction worker or group of construction workers to spend more time than anticipated near the ISFSI or resin storage area or spend time closer to these sources than anticipated, resulting in dose rates higher than anticipated. In addition, the applicant acknowledged that there are still uncertainties in the future loading of the ISFSI and resin storage area and the occupancy patterns of CCNPP3 construction workers. Based on this information, the staff agreed with the applicant that a radiation protection program is necessary in order to ensure that individual construction workers do not receive doses in excess of the 10 CFR 20.1301 limits.

CONCLUSIONS

After reviewing the applicant's calculations, the staff determined that the applicant will, indeed, have to rely on the Calvert Cliffs Units 1 & 2 radiation protection program to ensure that construction workers are not overexposed. In addition, the CCNPP3 FSAR needs to be updated to reflect the changes made in the calculation packages audited by the staff. Therefore, the staff has issued an additional RAI (RAI 391) to the applicant, in order to address these issues and other concerns related to construction worker radiation exposure during CCNPP3 construction.