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Sent: Friday, April 11, 2008 2:31 PM
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Cc: James Tatum; John Segala
Subject: Cooling Tower Evaluations

Attached is a writeup for possible approaches to improve the efficiency/effectiveness of the analyses and related NRC reviews for performance and environmental impact of cooling towers at new reactor facilities. This issue was the subject of previous discussions between NEI/EPRI and the plant systems branch in the NRC's Office of New Reactors. This email is intended to advance those discussions and we can, as needed, follow with more formal correspondence and/or meetings. Once you have had an opportunity to discuss this topic internally and with your stakeholders, please give me a call (301-415-7490) and we can arrange the next interactions between NEI/EPRI and the NRC.

EVALUATION OF COOLING TOWER PERFORMANCE AND ENVIRONMENTAL IMPACT DURING REACTOR LICENSING

Introduction

Some of the new reactor license applicants have proposed to use cooling towers for normal operation heat dissipation as well as for their safety-related ultimate heat sink. The Nuclear Regulatory Commission (NRC) staff's evaluation of cooling towers includes confirmatory analyses of the safety-related performance capability (i.e., heat transfer and water inventory) and potential impacts on the environment and plant design/operation for the most limiting conditions that are postulated for a particular site. Historically, cooling tower performance capability has been evaluated using an unnamed code (a combination of various subroutines) that was developed by the University of Illinois in mid-1980. The potential impacts on the environment and plant design/operation has been evaluated using the Seasonal/Annual Cooling Tower Impact prediction code which was developed by Argonne National Lab under Electric Power Research Institute (EPRI) sponsorship.

Problem Statement

The analytical codes used by the NRC staff to evaluate cooling tower performance capability and potential impacts on the environment and plant design/operation need to be updated/revised to support new reactor licensing and potential new uses of cooling towers in the future by current power reactor licensees. The current versions of these codes are not very user-friendly (*e.g.*, they were designed to be used on computer mainframes and have mediocre user documentation), are not Y2K compliant, rely on meteorological data formats that are no longer used (*e.g.*, CD-144 and TDF-14), and need to be updated for hybrid cooling towers and cooling towers with plume abatement technology. These codes need to be converted for use on personal computers with revised and updated documentation.

Background

In evaluating the feasibility of updating the analytical methodologies referred to above, the NRC staff contacted the University of Illinois and found that the professor who was principally responsible for developing the cooling tower performance analysis code is available and interested in doing this work. The professor thought that the environmental effects and performance analyses could be combined into a single code, updated and validated within about a one-year time frame.

Options for Proceeding

Preferred Option: Nuclear Energy Institute and EPRI establish an industry initiative to work with the University of Illinois professor to combine the environmental and plant design/operation impacts and heat transfer analyses for cooling towers into a single updated code that has been validated, well documented, able to run on a personal computer. The NRC staff would interface with the industry during the code's development to facilitate the staff's subsequent evaluation and approval of the code.

If this option is pursued and the code is approved by the NRC, the NRC staff would accept evaluations performed by new plant applicants or licensees who use the code in accordance with the staff's approval. While environmental impacts assessment using this code could be performed for applications that are submitted after the code has been approved, the staff expects that all new plant applicants would be able to use this code for confirming cooling tower performance during the inspection, test, analysis, and acceptance criteria phase. This option is preferred because industry would be better able to expedite the completion of this work and the subsequent evaluations of cooling tower performance will require less interaction between the NRC staff and applicants/licensees by minimizing the need for requests for additional information (RAIs). The uncertainty of the outcome of NRC's cooling tower evaluation, along with the potential associated impact on the project's review schedule, will also be reduced.

Alternative: NRC establishes a contract with the University of Illinois professor to complete this work.

If this option is pursued, the NRC staff will use the code to perform independent confirmatory analyses of cooling tower environmental impacts and performance capability. The applicant or licensee would have to resolve any substantive differences that are identified. This option is expected to take more time to develop the code due to anticipated contract delays. This is not the preferred option because this approach will require more interactions between the NRC and applicants/licensees when completing cooling tower evaluations, likely resulting in many RAIs and substantially more time for the NRC to complete the evaluations.