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October 31, 2008

MEMORANDUM TO: William H. Ruland, Director  
Division of Safety Systems  
Office of Nuclear Reactor Regulation

FROM: John Lehning, Reactor Systems Engineer /RA/  
Safety Issues Resolution Branch  
Division of Safety Systems  
Office of Nuclear Reactor Regulation

SUBJECT: COMBINED QUICKLOOK/FINAL FOREIGN TRAVEL TRIP REPORT  
NRC STAFF TRIP TO WUHAN, CHINA, TO PARTICIPATE IN AN  
INTERNATIONAL ATOMIC ENERGY AGENCY WORKSHOP ON  
EMERGENCY CORE COOLING SYSTEM STRAINER PERFORMANCE

One Nuclear Regulatory Commission (NRC) staff member traveled to Wuhan, China, to participate in an International Atomic Energy Agency (IAEA) workshop on emergency core cooling system (ECCS) strainer performance that was held from October 14-16, 2008. The workshop was held under the auspices of the IAEA extrabudgetary program on the safety of nuclear installations located in countries in Southeast Asia, the Pacific, and the Far East. The primary purposes of the workshop were to provide (1) an overview of operating experience concerning ECCS strainer blockage events that have occurred throughout the world, (2) an overview of the technical issues associated with ECCS strainer performance, and (3) a description of the regulatory efforts undertaken to resolve ECCS strainer performance issues in the United States, Japan, and China. A summary-level description of the staff's observations during the trip is provided in the enclosure.

Although the ECCS strainer performance workshop was completed on October 16, due to the use of personal leave, the NRC traveler did not return to the office until October 23. Therefore, this combined quicklook/final trip report was completed the week after the NRC traveler returned to the office.

ENCLOSURE:  
Post-Mission Quick Look and Final Trip Report

CONTACT: John Lehning, NRR/DSS/SSIB  
301-415-1015

Information in this document was deleted in  
accordance with the Freedom of Information Act.  
Exemptions 4, 10, 10.5, 25.0  
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**POST-MISSION QUICK LOOK AND FINAL TRIP REPORT**

**Workshop Dates:** October 14–16, 2008

**Traveler:** John Lehning, Reactor Systems Engineer, NRC/DSS/SSIB

**Location:** Wuhan, China

**Organization/Committee:** International Atomic Energy Agency (IAEA)

**Sensitivity:** Non-Public

**Trip Purposes:**

This trip was proposed for staff to attend an IAEA workshop on emergency core cooling system (ECCS) strainer performance issues being held from October 14–16, 2008, in Wuhan, China. The primary purposes of the workshop were to provide (1) an overview of operating experience concerning ECCS strainer blockage events that have occurred throughout the world, (2) an overview of the technical issues associated with ECCS strainer performance, and (3) a description of the regulatory efforts undertaken to resolve ECCS strainer performance issues in the United States, Japan, and China.

**Desired Outcomes:**

1. Provide technical and regulatory perspectives on ECCS strainer performance to attendees of the workshop from Southeast Asia, Pacific, and Far East countries.
2. Understand the current status of ECCS strainer performance issues among other workshop participants.
3. Gain insights on ECCS strainer performance issues from the technical approaches used by other workshop participants.

**Results Achieved:**

The staff fulfilled the desired trip outcomes, as follows:

1. The staff made two presentations at the workshop that summarized the activities conducted by the NRC and the U.S. nuclear industry to address strainer performance issues. The first presentation provided an overview of strainer performance issues in the United States from the mid-1970s to the present time. The second presentation focused on the current status of the NRC staff's reviews of corrective actions taken by pressurized-water reactor (PWR) licensees in response to Generic Letter 2004-02.
2. Based on the presentations made by attendees of the workshop from China and Japan, the staff obtained an improved understanding of the current status of strainer performance issues in these countries. As briefly noted below, while Japan has made significant progress in a number of areas, neither Japan nor China are currently implementing plant modifications to address all of the issues considered within the scope of Generic Letter 2004-02 for U.S. PWR licensees.
3. Based on the presentations made by attendees from China and Japan, the staff observed that many of the technical approaches implemented by these countries are derived from technical approaches originally developed in the United States by either the NRC or U.S. nuclear industry. However, several unique approaches were noted, some of which are mentioned below.

**Summary of Trip:**

The strainer performance workshop consisted of two days of presentations and a half-day tour of the facilities of the Research Institute of Nuclear Power Operation (RINPO) in Wuhan, China.

The attendance for the workshop is described in the following table:

**Table 1: Attendance of IAEA Workshop on ECCS Strainer Performance**

Organization	Location	Number of Representatives
International Atomic Energy Agency	Vienna, Austria	1
U.S. Nuclear Regulatory Commission	Rockville, MD	1
Japanese PWR Utilities	Japan	2
Chinese Nuclear and Radiation Safety Center	China	2
Chinese PWR Utilities / Research Organizations / Industry Representatives	China	29
Transco Products, Inc.	Chicago, IL	2

The workshop was opened by the IAEA representative (T. Okamoto), who proceeded to present a summary of operating experience on strainer plugging events that primarily focused on the events at Barsebäck (a Swedish boiling-water reactor) in 1992 and at Perry Nuclear Plant in 1993.

The NRC staff (J. Lehning) then made a presentation that summarized the activities and key lessons learned for the NRC and U.S. nuclear industry, starting with the issuance of Regulatory Guide 1.82, Revision 0, in June 1974, and continuing through Unresolved Safety Issue A-43, the boiling-water reactor ECCS strainer issue, and Generic Safety Issue 191 up to the present time. A subsequent NRC staff presentation covered the current status of the staff's reviews of PWR licensees' corrective actions in response to Generic Letter 2004-02 and the planned approach for the completion of these reviews. The presentation included a discussion of some of the technical issues that have not been fully resolved for some plants at the present time.

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Chinese presenters (Y. Liu, G. Ge, D. Zhang, H. Chen) from various organizations presented perspectives on ECCS strainer performance issues in China, including information concerning certain reactors' strainer designs, basic regulatory requirements, and future plans to ensure adequate strainer performance. Currently, China has 11 operating nuclear power plant units of a variety of designs (French-designed 3-loop PWRs, Canadian-designed pressurized heavy-water reactors, Russian-designed VVER PWRs, and Chinese-designed PWRs). Currently, there are also 28 additional units that are either planned or under construction, including two new reactor designs that are also being considered by some U.S. utilities (Westinghouse's AP1000 and Areva's EPR). Most of the presentations focused on ECCS strainers for the new reactor designs.

Exemption 4  
10 CFR 2.390(d)(2)

(b)(4)

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The NRC staff discussed with the Chinese regulators and plant operators several studies that were performed to estimate ECCS strainer blockage probability and risk for the fleet of U.S. PWRs. These studies resulted in near-term actions being taken in the United States to implement interim measures to reduce potential risks and the subsequent implementation of plant modifications to ensure adequate strainer performance.

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The tour of the RINPO facilities located in the outskirts of Wuhan highlighted a number of diverse areas in which RINPO provides technical expertise for the Chinese nuclear industry. Among other things, the tour showed equipment used for non-destructive examination of pipes and components such as vessel heads, steam generators, and pressurizers; diagnostic equipment for various types of valves; computer laboratories where plant simulators are developed; and an internal website for the Chinese nuclear industry that contains domestic and international event reports, performance indicators, regulations, news, and other information.

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**Were policy issues or other items of Commission interest raised?**

No.

**If yes, how will the Commission be informed?**

Not applicable.

**Contact Information:**

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