

August 4, 2004

MEMORANDUM TO: Marsha K. Gamberoni, Acting Branch Chief
Advanced Reactors and Regulatory Effectiveness Branch
Division of Systems Analysis and Regulatory Effectiveness
Office of Nuclear Regulatory Research

FROM: Stephen M. Bajorek, Senior Technical Advisor */RA/*
Advanced Reactors and Regulatory Effectiveness Branch
Division of Systems Analysis and Regulatory Effectiveness
Office of Nuclear Regulatory Research

SUBJECT: SUMMARY OF JULY 13-14, 2004, TRIP TO AECL FOR THE
PURPOSE OF EXAMINING THE THERMAL HYDRAULIC TEST
FACILITIES AT STERN LABORATORY

Attached is a summary trip report for our travel to Toronto Canada. On July 13-14, 2004, the Office of Nuclear Regulatory Research (RES) and the Office of Nuclear Reactor Regulation (NRR) staff traveled to Ontario, Canada to visit Stern Laboratory and the offices of Atomic Energy of Canada, Limited (AECL). Attending from RES were Stephen Bajorek, David Bessette, and John King. Attending from NRR were James Kim, Walton Jensen, and Samuel Miranda. The purpose of the visit was to gain a better understanding of existing test facilities used to provide thermal-hydraulic data in support of the ACR-700 design. The purpose of this memorandum is to provide you with a report of the lab tour and summary of discussions at the AECL meetings.

No Actions by the Commission are recommended as a result of this trip.

Attachments: As stated

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INTERNATIONAL TRIP REPORT

Subject: SUMMARY OF JULY 13-14, 2004, TRIP TO AECL FOR THE PURPOSE OF EXAMINING THE THERMAL HYDRAULIC TEST FACILITIES AT STERN LABORATORY

Dates of Travel, Countries and Organizations Visited: Stephen M. Bajorek, Senior Technical Advisor, et. al., Toronto, Canada. On July 13-14, 2004, Office of Nuclear Regulatory Research (RES) and Office of Nuclear Reactor Regulation (NRR) staff traveled to Ontario, Canada to visit Stern Laboratory and the offices of Atomic Energy of Canada, Limited (AECL).

Author, Title, and Agency Affiliation:

Stephen M. Bajorek, Senior Technical Advisor
Advanced Reactors and Regulatory Effectiveness Branch
Division of Systems Analysis and Regulatory Effectiveness
Office of Nuclear Regulatory Research

Sensitivity: None Noted.

Background/Purpose:

To meet with AECL and review the LASH and CWIT facilities for potential new testing. Review existing database from these facilities for adequacy and application to the ACR - 700.

Abstract: Summary of Pertinent Points/Issues:

The Office of RES and NRR staff traveled to Ontario, Canada to visit Stern Laboratory and the offices of AECL. The attendees were Stephen Bajorek, David Bessette, and John King. Attending from NRR were James Kim, Walton Jensen, and Samuel Miranda. The purpose of the visit was to gain a better understanding of existing test facilities used to provide thermal-hydraulic data in support of the ACR-700 design. The purpose of this memorandum is to provide you with a report of the lab tour and summary of discussions at the AECL meetings.

ATTACHMENT

On July 13-14, 2004, the Office staff of RES and NRR traveled to Ontario, Canada to visit Stern Laboratory and the offices of AECL. On July 13, 2004, the staff toured Stern Laboratory. Stern Laboratory maintains several test facilities for AECL and other reactor vendors. Of particular interest to the staff are the Cold Water Injection Test (CWIT) Facility and the LArge Scale Header (LASH) Test Facility. The CWIT facility has been used to generate two-phase flow and heat transfer information for horizontal fuel bundles. The LASH facility was used to investigate flow distributions in inlet and outlet headers. Neither facility is currently being actively used in a test program and some refurbishment would be necessary before testing could be performed in them again. In the LASH facility for example, the steam boiler has been removed and is being replaced. The gamma densitometers have been removed and are being used at AECL's Whiteshell Laboratory in Winnipeg. Many of the conductivity probe rakes used to measure water distribution have been removed from the headers. Returning the LASH facility to operation was estimated to require 6 months to a year. The CWIT facility could be used for additional testing after some refurbishment. Cost and duration of the refurbishment would depend on specifics of the horizontal bundle.

On Wednesday, July 14, 2004, the staff was given a series of presentations at the AECL offices. The first presentation set forth the type, scope, and purpose of the various tests run in the CWIT and LASH facilities. The presentation included a video of an air-water flow visualization test performed in the Transparent Header Test Facility (THF). The THF is a large scale test facility located at Whiteshell. It was not well instrumented, but was used for flow visualizations. The video provided important insight into the fluid dynamics of the header refill process. A second presentation discussed the Canadian version of the PIRT process. From this discussion it was apparent that the Canadian approach seeks to validate codes against phenomena in general, whereas the U.S. approach is to benchmark codes against certain ranges of selected phenomena deemed pertinent to specific scenarios.

In discussions with AECL staff following the presentations, it was clear that AECL is concerned with adequacy of data for inlet and outlet header thermal-hydraulics. They have formed an internal working group that is reviewing the LASH experiments and are considering new tests in the THF. In addition, AECL is performing a new scaling analysis of the RD-14M facility. The working group is tentatively scheduled to complete its work late in 2004.

Also, on July 13, the staff toured AECL Laboratories. These labs included mock-ups of header to fuel channel connections, fuel channel end fittings, and full scale headers as part of a facility that tests refueling devices. AECL simulates the creep induced sagging and ballooning of CANDU pressure tubes, and also attempts to characterize the three dimensional flow and CHF behavior within these degraded tubes through fluid flow experiments involving simulated fuel bundles. Several photographs were obtained, and are available to those interested.

The trip was considered very useful to the staff in attendance. The test facilities and AECL full scale mock-ups helped improve understanding of the complex geometries associated with the ACR-700 design.