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Highlights on  
LWR Plant Analyzer Project  
for  
February 1983\*

PROGRAM: LWR Plant Analyzer Development  
FIN #A-3227

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This letter covers the highlights of the LWR Plant Analyzer Development Program for the month of February 1983. The program is budgeted under the activity number 60-19-01-03.

The High-Speed Interactive Plant Analyzer program HIPA-PB2 for the pressure vessel thermohydraulics in the Peach Bottom-II BWR power plant has been implemented earlier on the AD10 special-purpose peripheral processor for the purpose of demonstrating the AD10's computing capacity, accuracy and speed. It has been shown that the AD10 is capable of producing accurate thermohydraulic transients at ten times real-time computing speeds. Current activities center around the expansion of HIPA-PB2, to also accommodate neutron kinetics, thermal conduction in fuel elements, steam line dynamics, recirculation loop dynamics and control systems for the nuclear steam supply system.

1. Software Developments (H. S. Cheng, S. V. Lekach, A. N. Mallen and W. Wulff)

Testing of the steam line dynamics model is nearly completed. Good agreement has been achieved between AD10 and CDC-7600 computer simulations of the acoustic effects caused by a sudden closure of the turbine stop valve.

Scaling has been completed for the governing equations of thermal conduction in fuel elements. The model equations have been coded and all the function tables have been completed. The model is now being checked out.

A master plan has been developed for synchronizing the two AD10 units. This plan serves to program the Bus-to-Bus Interface Processors (BIPs) which connect the two AD10 units directly, without the host computer.

2. Systems Software Implementation (R. S. Horwitz, S. V. Lekach and A. N. Mallen)

The advanced version RSX-11/4.0 of the PDP-11/34 host computer's operating system has been implemented to accommodate the new AD10 Modular Programming System MPS-10, Version 3.0.

The newly developed but not yet completely tested MPS-10, Version 3.0 has also been implemented, with the assistance from Applied Dynamics International. This new version affords more allocation of memory for program storage, greater speed for loading of data from disk to the AD10 via the host computer, and a number of minor improvements.

The new version of MPS-10 required a number of modifications to the HIPA-PB2 program. These have been carried out. Work continues to execute and check out the previously verified version of HIPA-PB2 under the new MPS-10 version. Following the successful simulation of the thermohydraulics under MPS-10, Version 3.0, we will synchronize the two AD10 versions to simulate also neutron kinetics, thermal conduction in fuel elements, recirculation loop flows and systems controls, thereby using the previously checked-out program modules.

### 3. Other Activities

Program reviews and plant analyzer demonstrations have been presented to Professor I. Catton, UCLA and member of ACRS, and to Mr. G. Kaplan, Senior Associate Editor of IEEE Spectrum. A science news article, describing the NRC-sponsored plant analyzer development at BNL, was accepted for publication in the Journal of the European Nuclear Society.

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\* Via W. Kato's Office