

INTERIM REPORT

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Reactor Safety Research - FTS 427-4272

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INTERIM REPORT

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**ORNL**  
**FOREIGN TRIP REPORT**

ORNL/FTR-645

DATE July 16, 1979

SUBJECT: Report of Foreign Travel of F. R. Mynatt, Director of Nuclear  
Regulatory Commission Programs

TO Herman Postma

FROM F. R. Mynatt

PURPOSE: To participate in the 2D/3D Program Coordination Meeting in  
Munich, Germany.

SITES VISITED:

6/25-29/79 Gesellschaft für Garshing, Federal  
Reactorsicherheit Republic of Germany  
(GRS) mbH

ABSTRACT:

The primary purpose of this meeting was to present and discuss the current status of work on the 2D/3D Refill and Reflood Program involving the U.S., Japan, and Germany. The traveler presented the contribution of the ORNL Instrument Development Loop Program and participated in all discussions involving instrumentation.

509 112

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## REPORT

The purpose of the 2D/3D Program Coordination Meeting, June 25-29, 1979, Munich, Germany was to discuss and review the status of each subprogram, identify problems for Technical Coordinating Committee resolution, and review current issues of interest in detail. The overall agenda of the meeting was as follows:

- I. Monday, June 25
  - A. Introduction
  - B. UPTF Design Status, KWU
  - C. UPTF Corrosion Tests, KWU
  - D. SCTF Design Status, JAERI
  - E. CCTF Test Results, JAERI
  - F. CCTF Upper Plenum Structures, NRC
  - G. ORNL Instrumentation Status, ORNL
  - H. ORNL Instrument Development Loop Status, ORNL
  - I. INL Instrumentation Status, INL
  - J. UPTF -  $\Delta P$  Measurements in End Boxes, Battelle Frankfurt
  - K. TRAC Status, LASL
  - L. Control and Coupling of UPTF and SCTF, GRS
- II. Tuesday, June 26
  - A. UPTF  $\Delta P$  Measurements, Battelle Frankfurt
  - B. ORNL IDL Results, ORNL
  - C. Stereo Lens, LASL
  - D. ORNL Film and Impedance Probes, ORNL
  - E. UPTF/SCTF Conventional Instrumentation, KWU
  - F. UPTF/SCTF Vessel Penetration, KWU
- III. Wednesday, June 27
  - A. Report and Discussions of Meetings on Instrumentation Analysis and Design
  - B. TCC Problem Identification
  - C. Discussions of Problem Areas
- IV. Thursday, June 28
  - A. Discussion of Problem Areas
  - B. Preparation of Minutes
  - C. Report to TCC
- V. Friday, June 29
  - A. Remaining Issues

Minutes of the meeting will be available from the Technical Coordinating Committee. I will limit my report to personal observations on points of interest to the ORNL programs.

The current UPTF flow diagram was discussed and a drawing was provided. This diagram and the brief list of operating conditions should be of special interest to the Instrument Development Loop Program. UPTF now resembles an integral test with three unbroken and one broken loop. However, it is still a separate effects test because the operation results from imposing flow conditions on the vessel. An English language description of UPTF operation will be available in about three months. FRG later agreed to supply the present German language version to the TCC by the end of this meeting. We will have to get a copy from W. S. Farmer, the NRC 3D program manager.

The UPTF core simulator varies in the present design from that upon which we based the IDL. The present version allows the water to flash into steam in a choke flow state before injection with the dry steam in the lower plenum. Bill Farmer asked me if IDL should be changed. My guess is that we should not change unless we suspect control problems such as condensation effects in the lower plenum.

For switching from KWU to CE and W simulation the UPTF internals above the core support plate will be changed. This in principle will not affect end box instrumentation. I reminded Farmer and Y. Y. Hsu that the IDL program involves only the KWU internals. They acknowledged the problem and asked that we make recommendations regarding the importance of different internals at a later date. We have stated that the rod bundle dominates the hydraulics and INL has stated that different internals lead to totally different CCFL curves. I don't understand how both could be true.

SCTF design is progressing. For flow blockage tests SCTF will examine what they call a "significant" test rather than worst case. They will base their blockage on the multirod burst work of Kawasaki. We had extensive discussions on the problem that SCTF I has a short Westinghouse end box and the change to the SCTF II long KWU type end box produced a conflict with vessel penetrations. It was finally decided to hold the core support plate fixed and lower the tieplate for the KWU end box. This will necessitate a bend up or down for the  $\Delta P$  sensor lines.

The major instrumentation concern was in regard to the pitot tube and  $\Delta P$  sensors in the end box. Battelle Frankfurt made a presentation of their preliminary analysis which led to the conclusion that the long tubes (10 to 40 m) virtually eliminate the  $\Delta P$  system as a meaningful measurement system. Water purge is surely required and, because of the large purge pressure drop, must be interrupted before a measurement is made. Such an operation is impossible with the 350 msec response time required by the oscillatory nature of UPTF hydraulics. This was the major problem discussed by the TCC. UPTF preliminary design will be completed in August and many aspects of the design are already frozen. The TCC requested that ORNL increase emphasis on alternatives and also conduct scoping tests on long-line  $\Delta P$  measurement response by September 1, 1979. The  $\Delta P$  response tests are to consider both water purge and nitrogen filled lines.

Another UCSP instrument concern is the turbine meter position. Life would be easier if the turbines were above the core support plate. INL said their data indicated better performance there. I requested they hold the question until IDL tests are available. I don't see how the turbine works on top of the CSP with the flood of hot leg injection going by. It will be particularly hard for SCTF to put the turbines in the end box but it can be done with a dog leg design.

The UCSP turbines will be serviced from above by mounting them on long tubes to be lowered into position. Several of these tubes would interfere with hot leg water injection flow and the FRG successfully insisted that such tubes be eliminated by turbine installation by means yet to be determined.

I was informed repeatedly that the whole core support plate instrumentation issue depends on the current IDL tests and the possibility of better alternatives. I agreed to a mid-September meeting at ORNL to review results and reach a decision which would be confirmed in the November TCC meeting.

CCTF tests to date include four shakedown runs and two main tests. Peak temperature quench times mainly range from 100 to 200 sec. In shakedown test 4 the quench delayed to 600 sec. Spatial oscillations and parallel channel oscillations have not been observed. For the higher system pressures the upper plenum fills with a quiet pool of water while the core is yet unquenched. This behavior is still not explained.

Roberts (ORNL) and Brand (PKL) discussed the flag probe tests in the 3x3 PKL facility. While all comments are very preliminary there was concern about a film of water on the flag probe rod shorting out the electrodes.

An extensive discussion was held to set minimum requirements for UCSP instrumentation. As a result the FRG will supply by July 15, 1979, a table indicating various test conditions and accuracy goals. However, a 350 millisecond response time was agreed upon. The qualitative requirements are to allow UPTF-SCTF coupling and to determine mas. lows. The FRG said emphasis should be placed on learning what measurements are possible. Measurement of steam flow is of little concern. Measurement of net water flow is recognized as the maximum information in counter-current flow situations.

APPENDIX AItinerary

June 25-29, 1979

Participated in 2D/3D Program Technical  
Coordination MeetingPersons Contacted to a Significant ExtentU.S. Contacts

W. S. Farmer (USNRC)	D. M. Chapin (MPR)
Y. Y. Hsu (USNRC)	C. K. Lewe (NUS)
P. B. Bleiweis (LASL)	H. Renner (NUS)
D. Dobranich (LASL)	
W. L. Kirchner (LASL)	
R. E. Rice (INEL)	
R. D. Wesley (INEL)	

German Contacts

G. Hampel (Battelle)	H. Kiehne (KWU)
G. Haury (BBR)	K. Melchoir (KWU)
R. Loth (BBR)	Dr. Meseth (KWU)
E. Dluzniewski (GRS)	K. Riess (KWU)
H. G. Herdtle (GRS)	K. J. Schirmeister (KWU)
E. F. Hicken (GRS)	R. Strobel (KWU)
E. Kersting (GRS)	F. Winkler (KWU)
R. Kirmse (GRS)	
B. Pütter (GRS)	
V. Teschendorff (GRS)	
A. B. Wahba (GRS)	
K. Wolfert (GRS)	
B. Brand (KWU)	
R. Emmerling (KWU)	
V. Hoefes (KWU)	

Japanese Contacts

K. Hirano (JAERI)
Y. Murao (JAERI)
Y. Sudo (JAERI)
J. Sugimoto (JAERI)

509 116

APPENDIX BListing of Literature Acquired

1. Overview Schedule of the 2D/3D-meeting - June 25-July 3 in FRG
2. Minutes of Experts-Meeting: Instrumentation - June 26, 1979
3. Minutes of Experts-Meeting: Analysis - June 26, 1979
4. "ORNL Advanced Instrumentation Progress Report," M. J. Roberts
5. Preliminary drawing - 3D Projekt - UPTF - 3D Versuchsstand 3 Entwurf #704 400-V421F-00-7, KWU
6. "Design of TV-Internals," KWU
7. Upper Plenum Test Facility (UPTF) - Core Simulator - Double Ended Cold Leg Break
8. "Status of UPTF-Instrumentation," KWU-Karlstein, K. Melchior
9. "Slab Core Test Facility Design," JAERI
10. "TRAC Status and Applications to the 2D/3D Program," Paul B. Bleiweis and Dean Dobranich, LASL
11. "Data Transmittal and the Reporting of TRAC Analyses for the Multi-national Reflood Experimental Program," P. B. Bleiweis and W. L. Kirchner, LASL
12. Flow Blockage Test in the SCTF
13. "Aspects to the facility control systems of UPTF and SCTF - Proposal for further procedure," E. J. Kersting and Dr. B. M. Pütter, GRS
14. "Principal Objectives of Instrument Development Loop (IDL) Program," ORNL
15. "Rod Lens and Upper Plenum De-entrainment Experiments Status," Walter L. Kirchner, LASL
16. "UPTF - Distribution of Instrumentation within the TEST-VESSEL," H. Kiehne, KWU
17. "CCTF Test Results," JAERI
18. "Discussion of Problems Related to  $\Delta P$  and Pitot Tube Measurements in the End Boxes of the UPTF," G. Hampel, Battelle, Frankfurt
19. "Proposed Calibration Test Matrix for  $\Delta P$  and Pitot Tube Probes to be Used in the End Boxes of the UPTF," G. Hampel, Battelle, Frankfurt
20. "Status of INEL Instruments," Richard E. Rice, INEL
21. Drawing - Gesamtschaltplan - UPTF-3D Versuchsstand #R141-F-)V-13176 a





## DISTRIBUTION

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7. L. S. Tong, Assistant Director, Division of Reactor Safety Research, NRC, Washington
8. W. S. Farmer, Manager, 2D/3D Program, NRC, Washington
9. Y. Y. Hsu, NRC, Washington
10. J. A. Lenhard, DOE-ORO
11. J. Pidkowicz, DOE-ORO
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