UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Docket No. 50-259

12/13/84

LICENSEE: TENNESSEE VALLEY AUTHORITY (TVA)

FACILITY: BROWNS FERRY NUCLEAR PLANT, UNIT 1

SUBJECT: MEETING WITH TVA - SINGLE LOOP TEST

On December 13, 1984, we met with TVA in Chattanooga to work out the details of a test program to evaluate the thermal-hydraulic stability of BWR-4s in the lower flow area of the power flow map. For over four years, the NRR technical staff has had concerns regarding the stability-related aspects of single loop operation. Because of these concerns, we have had applications for approval of single loop operation from ten BWR facilities which have been "on hold" for several years.

On February 10, 1984, General Electric Company (GE) issued Revision 1 to SIL No. 380 as a result of new stability test data from a foreign BWR. The SIL provided "additional operating recommendations in the unlikely event that thermal hydraulic instability induced neutron flux oscillation occur" in the high power/low flow corner of the power flow map. As the SIL pointed out, "this region may be encountered during startup/shutdown, during rod sequence exchanges and as a result of a recirculation pump(s) trip event" - whether operating with one or both recirculation pumps. The tests referenced in SIL No. 380, Revision 1 were run on a foreign BWR-6 with a comparatively high power density (about 56 kw/liter). Since the magnitude of the flux oscillations are related to power density, the instability would be expected to be less in a BWR-4 such as Browns Ferry with a lower power density (about 48.7 kw/l). GE noted that SIL No. 380 was not applicable to BWR-3s such as Pilgrim 1 and Monticello because of their low power densities (less than 40 kw/l). Last spring, we had informally discussed with TVA the desirability of conducting a test of thermal-hydraulic stability at Browns Ferry Unit 1; our request was formalized by our letter of July 12, 1984. In its response of October 11, 1984, TVA agreed to conduct a single loop operation test at Browns Ferry Unit 1. TVA requested a meeting with us and any involved consultants to work out details of the test program. This memo summarizes the result of the requested meeting.

TVA was represented at the meeting by personnel from its fuels, BWR core design, engineering analysis, reactor engineering, methods and licensing groups in Chattanooga and by reactor engineering and compliance staff from the Browns Ferry plant. TVA personnel had also discussed the test program with GE. The NRC was represented by the Core Performance Branch, the writer and three consultants from ORNL. A partial attendance list is enclosed as Enclosure 1.

TVA had outlined a proposed test program which is enclosed as Enclosure 2. ORNL proposed a slightly different test program which TVA agreed to conduct. TVA's position was that if the program suggested by ORNL would resolve whether or not there is a significant thermal hydraulic stability problem, this is what they would run. The agreed upon test would take data at seven points as shown in Enclosure 3, including one point on the 80% rod line.

Although TVA has the necessary recorders and equipment for the test, ORNL indicated that they preferred that TVA use recorders supplied by ORNL. TVA agreed to this arrangement. ORNL is to deliver the equipment to the site at least a week prior to the test. Although power will change by maybe 1% to 2% during the test, ORNL prefers that control rods not be moved, but let the power level adjust where it will.

Browns Ferry 1 will reach the end of nominal core life about the end of March 1985. To have sufficient reactivity to conduct the single loop operation test, it will have to be run by mid-February 1985. TVA will have to prepare a test procedure and have it approved by Plant Operations Review Committee (PORC). Considerable flexibility is needed in the test procedures with respect to power levels, hold times, etc.; if the results were known, there would be no need to conduct the test. Tentatively, the test is scheduled for the first weekend in February. The alternate date is the weekend of February 9 - 10, 1985.

While TVA agreed to all aspects of the test program as suggested by ORNL and NRC, there was a major difference of opinion on what the test program might accomplish. The position of NRR's technical review branch is that if the test shows no significant thermal hydraulic stability problem, the results would support single loop operation with the same restriction approved for Peach Bottom Unit 3. TVA's position is that if there is no indication of a problem, this should support single loop operation without restrictions.

Richard J. Clark

Richard J. Clark, Project Manager
Operating Reactors Branch #2
Division of Licensing

Enclosures:
As stated

cc w/enclosures:
See next page

TVA 488 (ENDES 3-77)

SHEET ____ OF ____

ATTENDEES

NRC/ORNL/TVA MEETING - SINGLE LOOP TEST AT BFN
DECEMBER 13, 1984

COMPUTED DATE

CHECKED DATE

Name	Organization
R.E. ROGERS	TVA / NUCPR Licensing
JOSE MARCH-LEUBA	ORNL
BC [illegible]	[illegible]
Jerry Robertson 855-3011	TVA / [illegible]
J.D. Wolcott 729-3845	TVA / Rx Engr Supv - BFNP
FRANK BURROW	TVA / Engineering Analysis / Chattanooga
MIKE GARRETT	TVA ENGINEERING ANALYSIS / CHATT
SAM FOHLER	TVA / method Gp / Chatt
Don Gardner	TVA / BWR Core Design / Chatt
Bill Williamson 729-3845	TVA / Rx Engr - BFNP
Pedro J. Otaduy	ORNL FTS 624-5542 / 626-82
FRANK J SWEENEY	ORNL FTS 624-5569
DICK CLARK	NRC - Browns Ferry Project Manager

BWR 6 50 [illegible] power density

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DECEMBER 13, 1984

PROPOSED SINGLE RECIRCULATION LOOP FLOW TEST

12/13/84

Proposed Single Recirculation Loop Test

Test to be performed on: BFNP Unit 1
January or February 1985

Data Signals to be recorded for analysis:

1. 1 APRM Signal
2. 3 LPRM Signal (at B level)
3. 1 LPRM Signal (at C level)
4. 1 Active Loop Flow Signal
5. 1 Inactive Loop Flow Signal
6. 2 Jetpump Signals in Active Loop (double tapped)
7. 2 Jetpump Signals in inactive Loop (double tapped)
8. 1 Core Delta Pressure Signal
9. 1 Reactor Pressure Signal

Total of 13 signals to be recorded.

Length of time at each test plateau:

13 Data signals recorded on magnetic tape (suitable for analysis by Oak Ridge) for 30 minutes at each test plateau.

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Test Plateaus: Minimum Test Plateaus

TP1 - single pump, 50% power, ~100% rod line

TP2 - single pump, ~~40%~~ ~42-45 power, ~100% rod line cannot stay on 100% rod line below ~40% power

TP3 - single pump, ~~30%~~ ~40 power, ~100% rod line

Possible Additional Test Plateaus:

TP4 - single pump, 60% power, ~100% rod line

TP5 - single pump, 75% power, ~100% rod line

TP6 - Dual pumps, 30% power, ~100% rod line

TP7 - Dual pumps, 45% core flow , ~100% rod line

Milesstones to be completed:

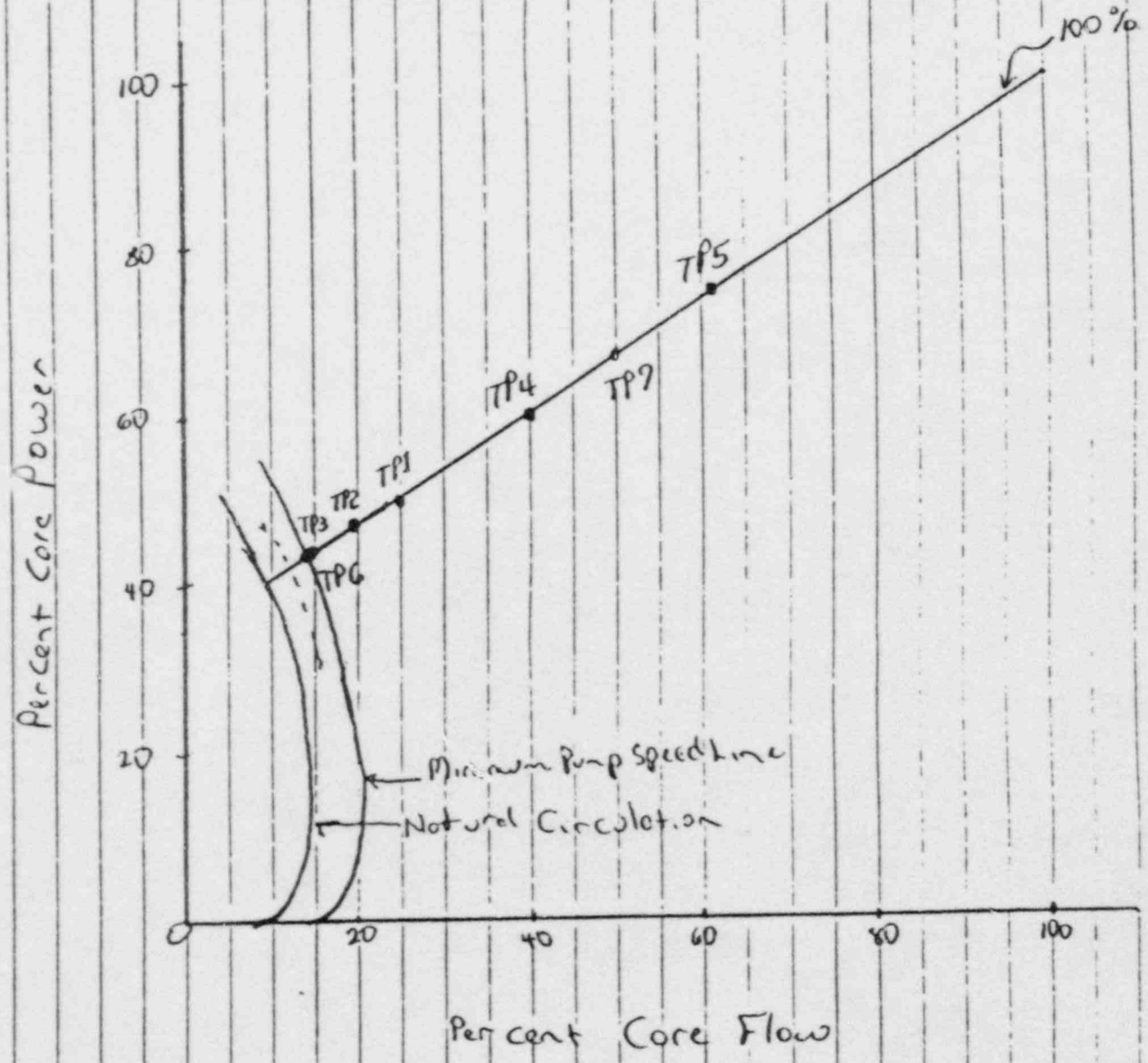
12/13/84- 1. Finalize test requirements - obtain NRC/ORNL concurrence

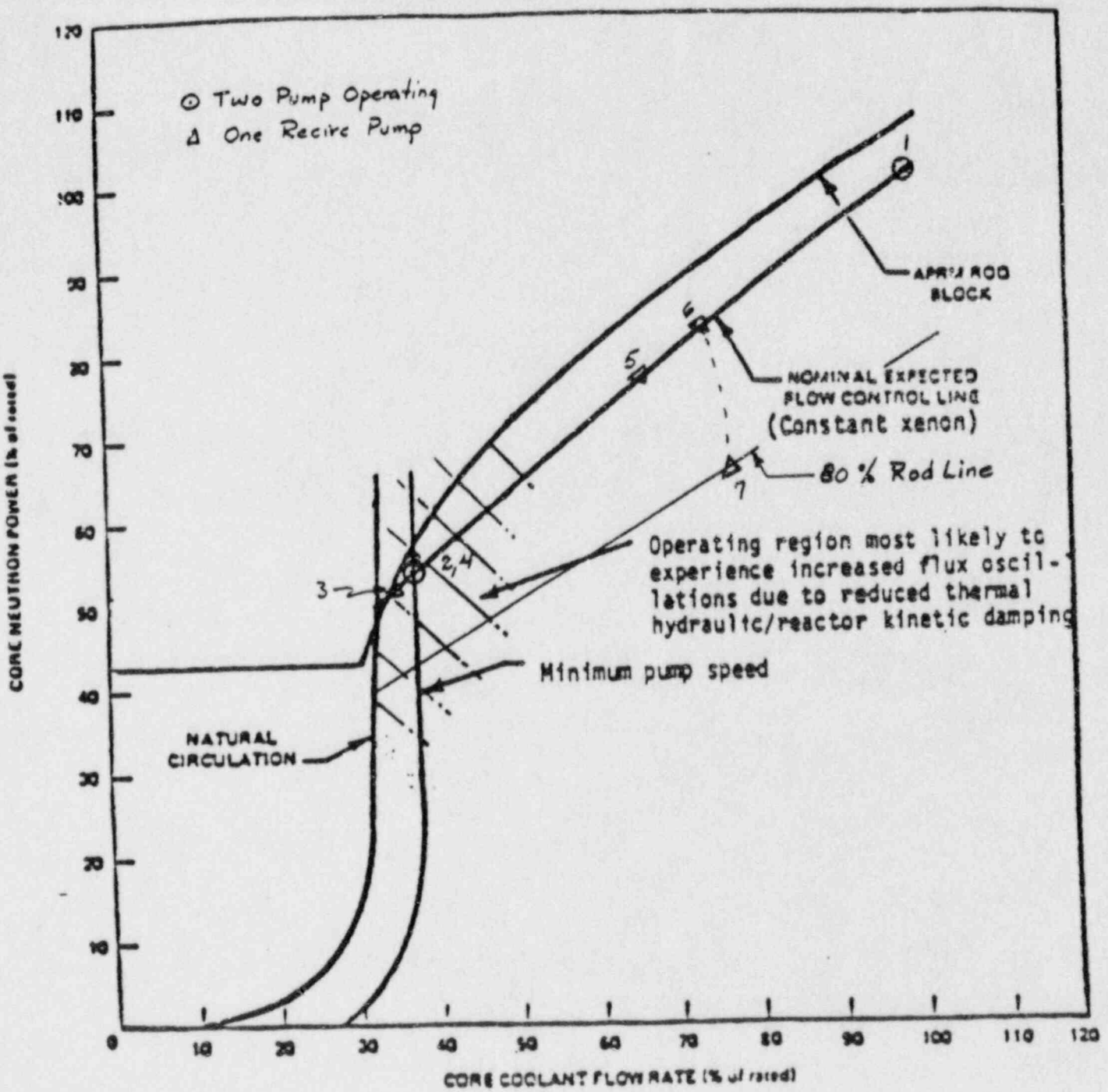
2. Write test procedure and attendant 10 CFR 50.59 review; PORC review and approval

3. Prepare test equipment

4. Schedule test as load requirements permit

12-13-84


100 % Rod Line
TP5
TP4
TP7
TP1
TP2
TP3
TP6
Minimum Pump Speed Line
Natural Circulation
100
80
60
40
20
0
20
40
60
80
100
Percent Core Power
Percent Core Flow



TYPICAL BWR POWER FLOW MAP

enclosure 3