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Docket Nos. 50-259
50-260
50-296

NOV 8 - 1982

Mr. Hugh G. Parris
Manager of Power
Tennessee Valley Authority
500 A Chestnut Street, Tower II
Chattanooga, Tennessee 37401

Dear Mr. Parris:

SUBJECT: SINGLE LOOP OPERATION

Re: Browns Ferry Nuclear Plant, Units 1, 2 & 3

Reference is made to your application of March 4, 1982 (TVA BFNP TS 172) for amendments to permit operation of the Browns Ferry units at reduced power with a single recirculation loop in service. By your letter of September 3, 1982 you responded to our request for additional information regarding the instrumentation and control system aspects of operation with a single loop; our review of this item is essentially complete. We have also completed our review of the analyses, performed for you by the General Electric Company, related to the minimum critical power ratio operating limit and the proposed reductions in the maximum average planar linear heat generation rate (MAPLHGR) limits for single loop operation.

The experience at Browns Ferry Unit 1 in the fall of 1978 when this unit was operating on a single loop has raised concerns about the thermal hydraulic stability of the Browns Ferry units during single loop operation. To complete our review of your application, we will need a response to the enclosed request for additional information.

The reporting and or recordkeeping requirements contained in this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,

Original signed by
D. B. Vassallo
Domenic B. Vassallo, Chief
Operating Reactors Branch #2
Division of Licensing

Enclosure:
As stated

cc w/encl
See next page

OFFICE	DL:ORB#2	DL:ORB#2	DL:ORB#2				
SURNAME	SNorris	RClark	DVassallo				
DATE	11/8/82	11/8/82	11/8/82				

Mr. Hugh G. Parris

cc:

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BROWNS FERRY UNIT NOS. 1, 2 AND 3
REQUEST FOR ADDITIONAL INFORMATION
SINGLE LOOP OPERATION
DOCKET NOS. 50-259, 50-260 AND 50-296

1. The frequency of the oscillation at Browns Ferry Unit No. 1 (BF1) (0.3-0.5 Hz) is essentially the same as the characteristic frequency of BWR density-wave oscillations. The postulation that the increased flow noise is primarily due to the increased flow rate and inherent flow noise in the active jet pumps is plausible but we require substantive proof that this is the case. Experimental or calculational results which predict that the observed flow fluctuations can produce the observed magnitude and frequency of neutron flux would provide sufficient proof as long as the power-void feedback can be shown to be small. Calculational results which predict the observed frequency for the BF1 conditions or experimental results which are extrapolated to the BF1 conditions would provide sufficient proof. For arguments based on calculational methods, the codes used, boundary conditions, and calculational assumptions should be provided together with major input and output values. For arguments made based on experimental results, experimental values should be provided and the assumptions made to extrapolate these results to BF1 conditions should be explained.

2. Based on the Browns Ferry operating experience and the generic evaluations and studies the General Electric Company (G.E.) has performed, justify that single loop operation is safe and acceptable within the limits prescribed by G.E. in the specific licensing reports in which G.E. has analyzed the Browns Ferry units. In your answer demonstrate that for limit cycle oscillations of flow and neutron flux that bound the magnitude of those observed and expected in single loop operation, the safety limits are not exceeded. The evaluations should include the bounding conditions of flow, temperature and pressure and any uncertainties that are predicted for these conditions. Also show that the Critical heat flux correlation used is valid.

3. Discuss the possible reasons for, and contributing factors to, the observed flow and neutron flux variations observed in the Browns Ferry 1 operating experience.

4. Cross flow components in the downcomer region may have occurred as a result of reverse flow in the inactive jet pump bank and may have contributed to the flow oscillations recorded in the individual jet pumps of the Browns Ferry Plant during single loop operation.

Provide vibration data showing that the structural integrity of the jet pumps and other vital vessel internals is not threatened by single loop operation under these conditions of reverse flow.

5. In order to compare single-loop operation with two-loop operation, power to flow ratios should be evaluated in addition to jet pump flows. Provide available data showing a comparison of power to flow ratios and expected decay ratio ranges for single loop operation and two loop operation.

   Discuss the expected core inlet flow distribution/symmetry during single loop operation (for example, the effect on the hot channel v.s. the average channel).

6. Provide a power flow map which incorporates data points of the BF-1 single-loop operating history. Clearly designate the range where oscillations were experienced.

7. It was shown in NUREG/CR-1718 that finite amplitude oscillations can trigger a subcritical bifurcation (i.e., divergent oscillation) in a region of linear stability. The larger the amplitude of the oscillationts, the greater is the potential for divergent oscillations. Show that the core is stable for the largest amplitude oscillation which is predicted. Explain how non-linear effects are included.

8. Is TVA aware of any data or experience on single-loop operation at high flow and power from any other BWR's other than Browns Ferry? If so, discuss the applicability of this data, particularly as to whether it affects conclusions drawn from the Browns Ferry data.