

AUG 18 1983

MEMORANDUM FOR: G. C. Lainas, Assistant Director
for Operating Reactors, DL

FROM: L. S. Rubenstein, Assistant Director
for Core and Plant Systems, DSI

SUBJECT: SINGLE LOOP OPERATION FOR BWRs

Reference: Memorandum from L. S. Rubenstein to G. C. Lainas "Single Loop Operation for BWRs", July 27, 1983.

In my memorandum of July 27, 1983 we agreed with your proposal to issue single loop amendments for Browns Ferry Units 1, 2, and 3 with the proviso that they complete a successful single loop test. The acceptance criteria for the TVA test has been developed by CPB in conjunction with our contractor, ORNL, and are given below:

Test data at three single-loop power levels and flows, one at 50% power, one at minimum pump speed, and one in between are to be taken by moving along the power/flow limit line while maintaining reasonably constant rod position.

1. The first criterion requires that all three DR's shall be less than 0.75.
2. The second criterion requires the trend of the three readings to be taken into account, e.g.:
 - a. Suppose all three DRs are the same. If the DR is $\ll 0.75$ the test is successful.
 - b. Suppose there is a rising trend as power increases: low DR at low flow, higher DR at higher flow/higher power. So long as the 50% power DR is $\ll 0.75$, SLO is acceptable up to 50% power.
 - c. Suppose there is a decreasing trend as power increases: higher DR at pump minimum, lower DR at 50% flow. Operation is acceptable from minimum pump speed to (probably) 50% flow. Additional measurements would be required for the latter. DR should be extrapolated to lower flows - if > 0.75 is predicted for flows $<$ "the minimum", then operation below such flows should be prohibited.
 - d. Suppose DR is low at the extremes and high in the middle. If the middle reading is close to 0.75 it would be hard to assume this bound was not exceeded at some point. Additional test points would be required.

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The test should be conducted in the following manner:

1. Chart traces should be taken of neutron noise for a few seconds as each test condition is approached, using paper speeds of about 1/2 inch/sec. On-line assurance should be obtained that noise is random and does not exhibit a relatively pure sine wave at any frequency in the range 0.2-1 hz. Such a trace as the latter would indicate a dominant mode and approach to instability. The peak-to-peak magnitude of neutron noise should not exceed 15% of the dc level at any time during the tests.
2. The major portion of the criteria are based upon measured decay ratios. These will be determined at Oak Ridge using output data from the tests, and can be available in 3-4 days following the test period. The reactivity coefficients at the time of the test as well as the test data themselves will be required by ORNL to analyze the data.

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L. S. Rubenstein, Assistant Director
for Core and Plant Systems, DSI

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