Westinghouse Electric Corporation
Water Reactor Divisions

Nuclear Technology Division
Box 355
Pittsburgh Pennsylvania 15230

January 16, 1981
NS-TMA-2369

Denwood F. Ross, Jr., Director
Division of Systems Integration
Office of Nuclear Reactor Regulation
U.S. of Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Dr. Ross:

Subject: COMMENTS REGARDING THE LOFT SPECIAL REVIEW GROUP'S STUDIES

References
1. T. M. Anderson (Westinghouse) to G. D. McPherson (NRC) letter NS-TMA-2231 dated 5/6/80.
2. S. Kellman (Westinghouse) to L. Leach (EG&G) letter SE-SRA-580 dated 12/6/79.
3. V. J. Esposito (Westinghouse) to L. S. Tong (NRC), letter VJE-NS-736 dated 5/21/79

The purpose of this letter is to provide the LOFT Special Review Group with Westinghouse's comments pertaining to future LOFT Test plans. The general framework of the potential future direction for LOFT was obtained through your letter of December 8, 1980, which outlined three options extending operation as long as FY 1985 and requested comments.

Westinghouse has provided extensive input in the past expressing our needs, concerns and desires for information from LOFT, as well as specific test definition and instrumentation recommendations to improve the quality and usefulness of test data. This information has been communicated through Westinghouse attendance at LOFT Review Group meetings and by numerous letters sent to EG&G and the NRC Division of Reactor Safety Research. A partial list of recent letters is specified by the References.

In assessing future LOFT test plans, as proposed in your December 8, 1980 letter, we first asked ourselves whether any of these tests are needed to provide data which can be used to further assure the safety of Westinghouse designed PWRs. Our conclusion is that none of the proposed tests are needed from a fundamental safety viewpoint. We next considered whether any of the proposed tests could provide additional information useful for code assessment. The following table summarizes those tests that, in our judgement, could yield potentially useful additional information. Some summarizing comments on each test scenario are provided in the enclosed attachment.

L3-6	Small Break with RCPs Running
L5-1	Intermediate Break In Cold Leg
L9-1	Loss of All Feedwater Transient
L4-1	Large LOCA with Upper Head Injection
L4-2	Large LOCA with Upper Plenum Injection

X601
S.1

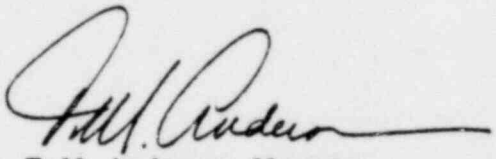
C

Westinghouse believes that the remaining tests presented in the table attached to your December 8, 1980 letter can be eliminated from future consideration for the reasons stated in the attachment. We believe that the Westinghouse recommended test matrix could be completed by the end of FY 1982. This would be similar in time to Option A of your letter.

We also would like to take this opportunity to again express our belief, as we have in the past, that LOFT tests are not representative of expected PWR behavior nor are the transient thermal hydraulic phenomena necessarily applicable to PWR transients due to scaling and other differences. Because LOFT is not a demonstration test of a commercial PWR, the test results are only useful as a tool to provide data to assess and verify models contained in computer codes.

We thank you for giving us this opportunity to express our views on LOFT. If we can be of further assistance or you request clarification on any of our comments, please do not hestitate to call Dr. V. J. Esposito of my staff.

Sincerely yours,



T. M. Anderson, Manager
Nuclear Safety Department

TMA/wpc

ATTACHMENT

WESTINGHOUSE RECOMMENDATIONS REGARDING THE LOFT SPECIAL REVIEW GROUP'S OPTIONS FOR FUTURE LOFT TESTS

This attachment provides Westinghouse comments on the potential options for future LOFT tests, as specified in the December 8, 1980 letter from D. F. Ross (NRC) to T. M. Anderson (W). All tests are discussed and organized in this report by their test series group.

L3 Test Series

The first test series discussed is the L3 small break series. Test L3-6 is a small break test with RCPs operating, and is the companion to L3-5. Both of these tests have been performed at the time of this writing. Westinghouse has agreed with the usefulness of these tests and has previously provided comments regarding them (Reference 1). These two tests will provide information to verify computer models used to assess the effect of RCP operation on the total vessel inventory during small break transients. L3-6 represents the expected worst case in terms of vessel inventory. Westinghouse analyses have predicted the worst case, in terms of PCT, to occur when the RCPs are tripped at some intermediate time. Two phase separation phenomenon immediately after RCP trip for this case and core recovery by accumulators are important determinants of the extent of clad heatup. An additional test with RCPs tripped at an intermediate time may also be shown to be desirable. However, this cannot be determined until full evaluation of L3-6 is completed. We are not recommending an additional test at this time. The L8-1 add-on test to L3-6 could provide steam cooling data at low decay heat. However, out of pile tests planned or already performed elsewhere are better designed to provide this type of data because of the LOFT external thermocouple attachment method. Therefore, the L8-1 test is not a worthwhile test to perform, in our opinion.

The proposed L3-3 small break test is defined to determine the boundary between capabilities of heat removal through the break and secondary side. The critical break size for this situation is highly dependent on secondary heat removal characteristics and inventory, as well as the scenario which scrams the reactor and interrupts feedwater. Therefore, the characteristics are highly plant and scenario dependent. We believe that the L3-3 test will not provide meaningful and useful data to increase the understanding of small break behavior, and identification of the energy removal boundary for LOFT is not of great significance. Much of the transient phenomenon is overlapped by other tests in the series. Therefore, we do not recommend further consideration of test L3-3.

L5 Test Series

The intermediate break test series L5 represents a region in break size between the small break L3 Series and the large break L2 Series. These tests provide unique data for LOFT to identify the transition during the transient from predominantely inertial behavior, typical of large break, to predominantely hydrostatic dominated, typical of a small break. This test will demonstrate a smooth transition of variables such as cladding temperature from large to small break. We believe that the cold leg intermediate break test L5-1 is the most interesting in the L5 series. We do not believe that L5-2, the hot leg intermediate break, will provide a significant amount of additional new information given that L5-1 is run. Either intermediate break location could provide information regarding the flow transition throughout the phases of the transient. The cold leg break location will be more severe, with greater primary mass depletion and core uncovery, and LOFT data at the two extreme break sizes at this location is available. Therefore, we do not think it is necessary to run both tests, and recommend that L5-2 be excluded.

L2 Test Series

The L2 large break test series has two tests included in the options presented. Test L2-5 appears to provide base line data for the L2-6

test where fuel damage is expected. Difficulties may arise for this test in terms of instrumentation and measurement of necessary variables as well as interpretation of the results. Other test facilities are more appropriate than LOFT to evaluate fuel behavior during worst hydraulic assumptions. It is our opinion that fuel damage tests are not necessary. However, if fuel damage tests must be considered, it appears to be more prudent to consider separate effects tests to look at phenomenological behavior. Therefore, it is our opinion that these LOFT tests should eliminated.

L6 and L9 Test Series

The L6 and L9 test series represent, in general, the operational transients and proposed ATWS scenarios. The L6 series tests for LOFT represent mild transient from a system view point that are of very limited value for code assessment. The reactivity feedback in LOFT due to the high enrichment will result in significantly different responses for transients such as rod withdrawal (L6-4) and cooldown transients (L6-7) than found in a commercial PWR. Furthermore, these types of transients in the L6 Series are typically influenced by the action of the various control systems. The control systems in LOFT and a commercial PWR are different enough to yield different transient response. Our comments pertaining to these tests have been passed along via Reference 2, as well as through informal discussions with EG&G personnel.

The L9 test series represents the classical ATWS transients. Westinghouse has concerns regarding the capability of the LOFT facility to model an ATWS event. The ATWS tests proposed for the L9 Series are for those initiating events that result in a pressure increase. From the numerous studies that Westinghouse has done as well as studies done by your own staff, the resulting overpressure is a very strong function of at least three parameters. The first parameter is the ratio of the moderator temperature coefficient to the fuel doppler temperature coefficient. The LOFT core necessarily has no doppler coefficient which would result in significantly different phenomena with regard to possible code assessment being modelled in the performed test. The second

parameter is the heat transfer in the steam generator during tube uncovery. If this parameter is not modelled correctly the time response will be significantly different than in a commercial PWR. Finally, the amount of overpressure that will result is dependent on the throat area of the safety valves. These parameters are not modelled in LOFT as they would be in a commercial PWR. These represent areas that are significantly different than in the previous LOCA review.

We would recommend that no tests in the L6 and L9 Series be performed because of the major differences found in LOFT and a commercial PWR with regard to the transients and ATWS modelling.

One exception to the above is test L9-1, which represents a loss of all feedwater. We believe that this test could be useful, not necessarily as an ATWS simulation, but as a multiple failure scenario. The most important phase of the transient occurs as the steam generator drys out, RCS repressurization occurs, and PORV discharge results in primary mass depletion. Westinghouse has analyzed this accident to assess the effectiveness of recovery techniques such as initiation of auxiliary feedwater and holding open PORVs. This type of experiment on LOFT including recovery scenarios would be useful for code assessment.

L8 Test Series

The L8 series tests represent the severe core damage scenarios. We believe that this test series should not be performed. The proposed tests are complicated integral system scenario tests that will yield a complex and potentially meaningless set of results. It is our opinion that separate effects tests are more useful to understand the severe core damage phenomena and provide information to further verify the conservatisms in existing models. Without these more basic tests, informed decisions on integral systems test definition and instrumentation requirements cannot be made. Tests performed to date on simpler facilities with less variables have previously looked at severe fuel damage. Two such tests are PBF and Kralsrule melt tests. These tests were better defined core melt tests, and will provide better data than

the LOFT facility. We also believe that LOFT core damage tests are not justified in light of the planned study of the TMI core. This program is already in place, and therefore, additional spending to obtain similar data from the LOFT facility is not warranted. It is our opinion that the L8 and L10 tests should be eliminated.

L7 Test Series

The L7 series tests represents the large LOCA plus steam generator tube rupture, with an objective to produce the case with the critical number of tubes ruptured. Westinghouse believes that these tests provide minimal new useful data and question the cost/benefit relationship for the following reason. The proposed scenario is an extremely low probability event. The large LOCA itself is of low probability and the steam generator tubes are designed to withstand the LOCA loads. The combination event postulating the critical tube failure is highly unlikely. These tests will not provide significant additional information regarding the system behavior characteristics or the effects of the multiple failure, since a number of similar tests have been run on the Semiscale Facility. Due to the design of the LOFT Facility, the test will not provide any information on recovery techniques. Given the extensive cost of these tests, the low probability of the event, and the limited data expected, we recommend that this test series be eliminated.

L4 Test Series

The final test series proposed are the L4 tests which include upper head injection and upper plenum injection large break tests. These systems, in commercial PWRs, represent major improvements to ECCS design and PWR safety. These tests could provide additional information for code assessment, such as the quantification of the large degree of conservatism imposed by present regulatory requirements. However we remain cautious of scaling and other LOFT atypicalities such as upper head and upper plenum volume as compared to a PWR that may result in behaviors that would not be expected in a PWR. From this standpoint, these tests similarly to all proposed tests, are not PWR demonstration tests. For example, scaling and other differences in the Semiscale Facility for similar tests resulted in behavior we believe is not typical for a PWR.