INTERIM REPORT

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August 6, 1979

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Dear Joe:

PWR STEAM GENERATOR TUBE INTEGRITY
PROGRAM: JUNE, JULY 1979 LETTER REPORT

Management activities concentrated on cost and scheduling aspects of the program. Proposal cost and schedules were updated to reflect shipping a Surry Steam Generator this calendar year. Support schedules for pre-shipment activity, transport, handling at Hanford and interim storage were developed and issued. A copy of the schedules was forwarded to NRC program management.

A trip to Washington D. C. was made by Robert Clark. He reviewed the research program plan with NRC program management. An initial research program plan was issued after these discussions.

During the trip a meeting was also held with DOT and Coast Guard consignment personnel to establish the best manner of obtaining approval to barge the Surry generator to Hanford. It was concluded that applying for a one time exemption from Low Specific Activity (LSA) radiation limits per unit material surface area was the best approach. Since we are very close to the defined limits for LSA under this criterion, and because the steam generator shell will serve as a strong container (stronger than surrounds standard LSA shipments) the DOE should be able to grant a one time exemption to allow an LSA shipment. Applying for an exemption would prevent institutional problems associated with our desire to qualify for LSA shipment on a radiation content per weight basis.

Surry Steam Generator Tasks

The finalized Functional Design Criteria (FDC) for the Steam Generator Examination Facility was issued. A Job Quality Plan for the Examination Facility design and construction was established and all required signatures obtained.

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The Functional Design Criteria (FDC) for Interim Storage Facility for the Steam Generator has been issued and is currently undergoing signature review. This report establishes guidelines for suitable temporary storage sites then evaluates several alternate sites in light of the guidelines. The study concludes with a recommended site in the 300 area near the waste processing ponds. This site has the advantages of nearby utilities, being inside the 300 area security fence, being away from densely populated work areas, and minimizing transport costs associated with interim storage. After review, the FDC will be submitted to the 300 area siting use council, then to DOE-RL for concurrence.

A request for proposal (RFP) for all preshipment activities was issued to Virginia Electric and Power Company (VEPCO) on June 18, 1979. Steven McKay (assistant project engineer for the Surry generator replacement) has been put in charge of responding to the RFP by VEPCO. We anticipate a response in early August. The contract will involve all onsite work at Surry to prepare the generator for transport. The work will be conducted by existing VEPCO contractors through task additions to existing contracts. Tasks include fixation of any external contamination, design, fabrication, and attachment of lead shielding, design, fabrication and attachment of transport support cradles, and loading the generator onto the shipment barge.

A work statement for the carrier was issued for review and comment. The statement was then finalized and an RFP for the carrier was completed. Issue of this RFP awaits commitment by NRC of supplementary FY 1979 funds.

The RFP for Marine Consultants was issued. The anticipated services include definition of wave movements and accelerations for lashing criteria, review of shipping cradle and lashing designs and development of emergency procedures.

The work statement for Lampson, the carrier responsible for Hanford on site transport, has been completed.

Conceptual design of the Steam Generator Examination Facility has been completed by Vitro engineering. Copies of the draft Conceptual Design Report are being distributed for comment. Completion, of the estimating portion of the conceptual design effort will be August 3, 1979.

All paperwork necessary to going out for bid on an architect-engineer for the steam generator examination facility has been prepared and submitted to DOE-RL. This includes a scope of work, schedules, and a Commerce Business Daily announcement. DOE-RL will not issue the request for proposal until sufficient program funding is visible.

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Nondestructive Testing Tasks

Measurements on initial stress corrosion cracked steam generator tube specimens indicated that a slight amount of specimen bulging was occurring in the stress corrosion cracked region. This situation would result in inaccuracies in eddy current readings. The bulging was due to the stress concentration in the area of the crack tip resulting after crack initiation. To alleviate the problem the internal pressure on the tubes in the stress corrosion cracking autoclave was lowered from just at the yield point ~6000 psi, to 4000 psi. At this pressure we still achieve specimen cracking in under 24 hours and the specimens have no discernible bulging.

The principle of operation employed in the stress corrosion cracking apparatus is to pressurize multiple specimens off a common manifold. When a thru-wall crack develops in any one specimen, pressure is relieved in all others and a switch also turns off the autoclave heaters. Thu further cracking of the remaining specimens is prevented by removing stress and process heat. Theoretically this takes advantage of the statistical spread in SCC initiation. We therefore obtain one thru-wall cracked specimen and several others with various degrees of wall degradation. Initial eddy current indications are that the defect matrix developed is skewed to >750% wall degradation. This may be due to an inability to detect stress corrosion cracks less than 40% of wall thickness. However, to increase the percentage of tubes with less crack penetration, we are defecting a tube, via a scratch, to cause its early thru-wall failure shuting down the SCC process.

The final report on tomographic analysis of stress corrosion cracks was received from Los Alamos. A copy of this report is attached. X-ray tomography can give accurate information of crack patters in the tube specimens. However, the instrumentation of the technique is not optimized, affecting presently obtainable resolution. The experimental nature of the equipment also inhibits cost effective operation. Presently about one specimen per week can be analyzed. A single crack specimen would cost ~$1000 and a multi-cracked specimen would be ~$2500.

Statistics Task

A statistics effort was initiated in July, at NRC request. This effort involved liaison with Bob Easterling's program at Sandia, development of a statistical basis for Surry generator tube sampling, and providing a statistical evaluation of Steam Generator Tube Integrity Program data on artifically defected tubes. Pamela Doctor will lead the statistics work.

Materials Tasks

The stress corrosion cracking of Inconel 600 tubing is proceeding well. Thirty-three acceptable specimens have been produced through July. As mentioned previously we have eliminated the problem of bulging in the

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defect zone. We have received a request from West Germany for specimens under their cooperative agreement with NRC. NRC program management needs to advise us on an appropriate response.

The second BWR 4" pipe weld stress corrosion cracking test was successfully completed on July 11, 1979, on the 246th cycle (two weeks run time). An analysis of the test data is being forwarded under separate cover. The acoustic emission and internal friction measurement devices appear to provide correlatable data. Both devices indicated early activity that should correspond to crack initiation. However, neither device showed evidence of incipient pipe failure within the last 50 cycles of life. Another specimen is being prepared for a repeat run in early August.

Structures and Mechanics Tasks

Predictive curve calculations for Phase I collapse data have been made. The curves and those derived earlier from Phase I and II burst data are undergoing a statistical analysis to establish proper 95% certainty bands. The completed figures will be available in August.

Reporting

The program research plan was submitted to NRC. A report on the first BWR pipe test was completed. Modified schedule information, reflecting accelerated Surry generator tasks, was forwarded to NRC.

Problem Areas

These problem areas currently present themselves. First a lack of committed funding information is hampering long range planning and slowing some contract activities which will cause slippage in Surry task deadlines. Second, there appears to be an internal NRC conflict, caused by an NRC section not involved in this program, which is hampering our operations by causing needless schedule delays and expenditure of man-hours. We have informed both DOE-RL and NRC-RSR management of this problem.

Yours sincerely,

R. A. Clark
Senior Research Scientist
Corrosion Research & Engineering

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Attachments