Attachment to Weeks, 9/3/80

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Mr. J. Strosnider
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Dresden Station Unit I Chemical Cleaning Project, Review of Commonweath Edision Submittal of March 27, 1980

Dear Jack:

During a recent visit to NRC, Warren Hazelton asked me for comments on this document. As you know, the entire philosophy (which the NRC accepted) for the safety of the chemical cleaning of the Dresden Unit I, using the NS-1 solvent, was predicated on the assumption that this solvent decomposed upon being heated to reactor operating temperatures to innocuous constitutents. At a meeting last fall, I expressed some concern upon learning that the licensee plans to leave the reactor system exposed to the air and at low temperature for an extended period of time prior to return to service. Therefore, any residual NS-1 solvent would not be decomposed by thermal treatment until approximately one year after the cleaning itself. The current submittal discusses the types of general corrosion one might anticipate from residual NS-1 not rinsed out of crevices. From the point of view of discussing a general attack in these crevices, this reply is, I believe, satisfactory. However, there are two specific concerns that, although they were expressed verbally to both G.E. and the licensee late in February, are not addressed in this document. These I would like to repeat here.

First, the NS-1 used in the cleaning operation is a rather aggressive acid at the cleaning temperatures and as such will be dissolving not only the crud deposits on the surface of the piping and on the surface of the reactor vessel cladding, but also a portion of these materials as well. In the process of dissolving the radioactive deposits and the underlying metal, the concentrations in the solvent of residual materials will build up, especially inorganic anions such as chlorides, that may have been adsorbed in the oxide deposits, or

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Sulfides or sulfur bearing compounds that may have been dissolved from the steel. The overall concern is that should an acid residue remain in the crevice in the presence of these inorganic anions, especially sulfates, sulfites, or chlorides, the possibility exists for a continued crevice corrosion during this long period period of shutdown. Within a tight crack, it is often very difficult if not impossible by normal rinsing techniques to remove this material. Further, the presence of any oxygen in the coolant can activate this crevice attack even though the water remaining in the bulk of the vessel and piping is of high purity. These acid crevices combined with an oxidizing potential, (resulting either from oxygen in the solution or from ferric ions present in the crevice) can lead to continued propagation of a pitting type corrosion reaction. The galvanic couples that might exist at the root of such a crack, especially if it penetrates the vessel cladding and goes into the carbon steel vessel material would only accentuate the problem. Crevice attack of the type caused by inorganic anions and an oxidizing species is not addressed by the licensee in this submittal.

Second, the licensee has suggested that stresses present in the reactor vessel and in the reactor piping are not great enough to cause through wall propagation of a stress corrosion crack during this extended shutdown period. The presence of residual stresses from welding are often quite sufficient to cause such cracks to propagate. Admittedly, the reactor vessel itself was stressed relieved following welding, but the piping was not; therefore, the chance exists that activated crevices could continue to propagate during an extended period of shutdown. Further, such crevice attack would continue in the absence of stress.

Also, the licensee has described spent chelate as being expected to behave as an ionized salt at moderately low pH, a model for this being ammonium sulfate, which has the equivalent conductivity at about 1% concentration. He then cites data from a report on simulated cladding cracks NEDC-24227, (which is not available to us) showing that a maximum of 70 mils of corrosion would occur along the bi-metallic interface in 4 days at 250°F. Without more data than are available to me at the present time, I would find extrapolation of these data for 4 days at 250°F to 300 days at a lower temperature rather difficult to achieve.

Conclusions:

While I remain convinced that decontamination of the Dresden I plant with the NS-1 solvent is a safe procedure and should be performed to lower radiation doses to operating and inspecting personnel, I feel that this safety is predicated upon the assumption that the residual solvent after leaching would be decomposed by heating the reactor to temperature essentially right away. In view of the long period of shutdown anticipated, I recommend that an extremely thorough rinsing procedure be established and concurred to by the NRC and that, if technically feasible, the traces of residual solvent be decomposed in some manner during/or subsequent to this rinsing process, perhaps by heating the reactor vessel and piping. If this decomposition is not achievable, perhaps some neutralizing treatment could be devised as part of the rinsing process to ensure that acidic residues in crevices do not remain during the long period in which the reactor coolant is exposed to oxygen and maintained at low enough temperatures that the residual NS-1 is not decomposed.

We would be happy to meet with you or G.E. or the licensee at their convenience to discuss these concerns further and the feasibility of possible remedial actions. I would also appreciate receiving a copy of the report NEDC-24227 listed as reference 3 in the subject document as soon as it is released. Thank you very much.

Sincerely,

John R. Weeks, Leader
Corrosion Science Group

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