



Commonwealth Edison

1400 Opus Place
Downers Grove, Illinois 60515

September 17, 1994

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Mr. William T. Russell, Director

Subject: Additional Information Regarding Steam Generator Chemical Cleaning in
Support of Application for Amendment to Facility Operating License:

Byron Station Units 1 and 2
(NPF-37/66; NRC Docket Nos. 50-454/455)

"Steam Generator Interim Plugging Criteria"

- References:
1. Letter from J. A. Bauer to W. T. Russell transmitting Byron Station's request for a license amendment to implement an Interim Plugging Criteria, dated August 1, 1994.
 2. Letter from J. A. Bauer to W. T. Russell transmitting a supplement to Byron Stations request for a license amendment to implement an Interim Plugging Criteria, dated September 7, 1994.
 3. September 9, 1994, Telecons between NRC Staff and Byron Station Staff regarding the effect of Steam Generator chemical cleaning on inspection results used for Interim Plugging Criteria application.

Dear Mr. Russell:

In references 1 and 2, ComEd submitted and supplemented a request to amend the Byron Station license to implement a voltage-based Interim Plugging Criteria (IPC) for Unit 1, beginning with the current refuel outage, designated B1R06, to be applicable for Cycle 7. B1R06 began when the Unit was brought offline on September 8, 1994.

One of the early activities of B1R06, a hot chemical cleaning of the Steam Generators, was scheduled to begin in the early AM of September 10, 1994. Three telephone conference calls were conducted on September 9, 1994 (Reference 3). During these calls, the effect of chemical cleaning on the eddy current signals used for implementation of IPC was discussed. As a result of these calls, ComEd agreed to docket a brief discussion of systematic changes in eddy current voltages due to chemical cleaning and the thought process that lead ComEd to conclude that no

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adverse effects would occur to interfere with the implementation of a voltage based repair criteria following chemical cleaning.

During the previous refuel outage, a video inspection of the secondary side of the steam generator was performed to assess the condition of the tubes and tube support plates. The video revealed that the tube support plate crevice regions were packed with deposits and the tubes were coated with deposits. Eddy current inspection also confirmed that the tube support plate crevices were packed, as indicated by deposit signals and distorted signals. Byron believes that packed crevices are detrimental to the tubing and are a contributor to outer diameter stress corrosion cracking (ODSCC). Therefore, Byron has decided to chemically clean the steam generators during B1R06 to help mitigate ODSCC at the tube support plates. A modified high temperature Electric Power Research Institute (EPRI) Steam Generator Owner's Group (SGOG) chemical cleaning process was selected. This process targets the cleaning of the tube support plate crevice regions through the boiling of the cleaning solution to agitate and replenish the solution in the crevice region. The chemical cleaning was performed in Mode 4 during the plant shutdown allowing plant heat to be used during the process.

As part of the decision process to chemically clean, ComEd evaluated the impact of chemical cleaning on the steam generators and the impact on non-destructive examination techniques, in particular, eddy current. The objective of the evaluation was to determine that chemical cleaning is 1) safe, 2) does not impact steam generator reliability, and 3) does not adversely affect eddy current results pertaining to the implementation of a voltage-based steam generator repair criteria. Evaluation of industry testing programs and chemical cleaning experience served as the bases for ComEd's conclusions.

In the late 1970s, extensive testing began on numerous chemical cleaning solvent systems. EPRI and others conducted the testing to ensure that no degradation of the tubing resulted from the cleaning process. An important element of the test program was extensive testing of chemically cleaned degraded tubing which was returned to service in various test vehicles. The clear conclusion of this testing was that chemical cleaning does not impact the integrity of the steam generator tubing with or without pre-existing degradation. The testing showed that chemical cleaning did not initiate tubing defects or propagate existing defects.

Other impacts of steam generator cleaning have been observed in the area of non-destructive examination. To a great extent these changes have been due to the removal of species from the tubes which may interfere with the NDE technique, such as copper. Field experience has demonstrated that removal of deposits by chemical

cleaning may improve the sensitivity of eddy current testing. Thus, smaller indications undetectable prior to chemical cleaning may be visible during an inspection following chemical cleaning.

Alternate repair criteria have been developed to ensure structural and leakage integrity of the tubing is maintained within the requirements of 10CFR100 for leakage concurrent with a main steam line break (MSLB). Correlations have been developed and approved by the NRC between the NDE parameter and the burst capability or leak capability of the tubing under MSLB conditions. For Byron, the alternate repair criteria NDE parameter has been identified as eddy current bobbin coil voltage.

Based upon extensive testing, it has been determined that a correlation exists between the bobbin coil voltage and the structural integrity of the tube. As the voltage increases, the structural integrity of the tube (i.e., burst pressure) decreases. A similar relationship of increased leakage under MSLB conditions with increasing bobbin coil voltage has also been determined through testing and has been approved for IPC application by the NRC. Therefore, it is necessary to consider the capability of the eddy current inspection technique to detect and accurately size defects following chemical cleaning when IPC is to be implemented.

The database regarding the impact of chemical cleaning on eddy current includes a number of plants that have done eddy current inspections before and after the cleaning. These experiences showed an increase in the number of indications observed following chemical cleaning. The impact on sizing of flaws following chemical cleaning is less clear. However, ComEd has determined that there is no data to suggest that chemical cleaning reduces the eddy current sensitivity or capability to size indications. The data that exists suggests that eddy current sensitivity is most likely unchanged or increased. Therefore, the eddy current capability to size indications is unchanged or increased. It is anticipated that more flaws may be detected following chemical cleaning and the distribution of flaw sizes could be skewed towards slightly larger indications. This results in more conservative tube leakage and burst assessments when applying IPC. Any decrease in the size of an eddy current indication following chemical cleaning is expected to be the result of other inspection factors not associated with the cleaning, such as normal eddy current variability. Measures have been taken to reduce the eddy current variability as specified in References 1 and 2.

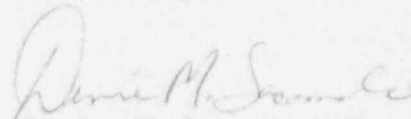
Based on the assessment that 1) chemical cleaning will help mitigate ODSCC, 2) chemical cleaning does not adversely affect eddy current results and 3) chemical cleaning is expected to result in a more conservative structural and leakage assessment for IPC, ComEd has decided to proceed with the chemical cleaning during B1R06 followed by the eddy current inspection with IPC implementation.

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ComEd has subsequently concluded that there are no safety concerns with the application of chemical cleaning prior to implementing the proposed voltage-based plugging criteria.

Please address any comments or questions regarding this matter to this office.

Respectfully,



Denise M. Saccomando
Nuclear Licensing Administrator

Attachments

cc: G. Dick, Byron Project Manager - NRR
H. Peterson, Senior Resident Inspector - Byron
B. Clayton, Branch Chief - Region III
Office of Nuclear Facility Safety - IDNS