Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

September 30, 1994

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

Attention: Mr. William T. Russell, Director

Subject: Additional Information Regarding 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: See Attachment

Dear Mr. Russell:

In references 1, 2 and 3 Commonwealth Edison Company (ComEd) submitted and supplemented a request to amend the Byron Station license to implement a voltage-based Interim Plugging Criteria (IPC) for Unit 1. Reference 5 provided additional information in response to Reference 4. As discussed during the Reference 6 teleconference, ComEd is providing the following information/clarification to information transmitted via Reference 5.

Item 2 - NRC asked for clarification regarding the methodology that will be used for the Byron leakage calculation.

Clarification of Response 2 - ComEd will perform the Byron leakage calculation using the EPRI conditional leakrate correlation with the full Monte Carlo methodology consistent with the Braidwood Safety Evaluation for the use of the Interim Plugging Criteria for Unit 1, dated August 18, 1994, page 12, Method 2 (Reference 7).

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Item 8 - NRC requested that ComEd identify and justify content contained in the VC Summer Appendix A guidelines which does not appear in the Byron Inspection Guidelines. Specifically, NRC questioned how analysts will determine whether an indication lies within the tube support plate during the Byron inspection.

Response 8 - The Byron/Braidwood Inspection Guidelines have been revised to include instructions on determining the confinement of an indication within a tube support plate. These instructions are consistent with Section A.3.7 of the VC Summer Appendix A Guidelines and were discussed in Reference 5.

A detailed discussion of the guideline content differences is contained in Attachment B. It should be noted that the Byron steam generator inspection process is carried out in three phases: acquisition, analysis, and disposition. The Byron Inspection Guidelines are provided as guidance specifically for the acquisition and analysis phases performed by a vendor. The disposition phase of the inspection is conducted by the Site Engineering Staff. The Site Engineering Staff has numerous resources available for consultation prior to making an engineering judgement on disposition of indications. These resources include industry data, industry guidelines, industry events, regulatory guidance, etc. Since the Inspection Guidelines are not intended to cover all phases of the disposition process, some of the information identified in the VC Summer Appendix A Guidelines does not appear in the Byron Inspection Guidelines used by the analysts. This information is identified in Attachment B.

Additionally, during the Reference 6 teleconference, ComEd was asked to respond to the following:

Item A - NRC requested that ComEd document the method for the conditional probability of burst calculation for Byron.

Response A - ComEd will use the conditional probability of burst calculation which includes a parameter uncertainty in the full Monte Carlo analysis. A detailed description of the analysis will be included in the final inspection report due 90 days following restart.

Item B - NRC requested clarification concerning the analysis conducted for "another plant" that is used in providing a conservative upper bound for the number of tubes per wedge group (WCAP-14046, Section 4.7).

Response B - Tubes are excluded from IPC application if combined LOCA + SSE loads result in diametral tube deformation exceeding 0.030" ($\Delta D > 0.030$"). This is a conservative criteria established to limit potential primary-to-secondary leakage, which could impact LOCA analyses. A nonlinear seismic analysis has not been performed to date for the Model D4 SG to obtain the loads for a detailed analysis of potential tube deformation. Both Braidwood Unit 1 and Byron Unit 1 have established leak-before-break (LBB) as a design basis for the primary piping which would limit the LOCA loads that dominate the top tube support plate (TSP) loads due to the rarefaction pressure wave associated with the LOCA event. However, the specific reduced LOCA loads associated with the primary piping LBB are not available for the Byron/Braidwood analysis. Since the SSE and LOCA loads necessary for a detailed tube deformation analysis are not available, a conservative estimate was made of the tubes to be excluded from IPC application at Byron and Braidwood as described below.

A RG 1.121 analysis performed for the KRSKO plant (Model D4 SGs), including LOCA + SSE loads, was reviewed and found to result in the potential for 9 tubes per wedge to collapse at a load of 182 kips (a total TSP load of about 270 kips). More conservatively, it was previously estimated that the potential for significant deformation and potential collapse was bounded by 27 tubes at the limiting wedge group for KRSKO.

The wedge load resulting in significant deformation ($\Delta D >$ 0.030") of 27 tubes is about 100 kips or a total TSP load of about 150 kips. The maximum TSP loads resulting from nonlinear seismic analyses performed for Model D3 plants (VC Summer and Catawba) are on the order of 100 to 130 kips. The Model D3 analyses have seismic spectra that are approximately 50% lower for one of the analysis and 50% higher for the other analysis than the SSE spectra for Byron and Braidwood. The number of wedge groups for the Model D3 SGs are comparable with the Model D4 SGs. For the Model D3

upper bound seismic case, the maximum number of affected tubes per TSP ($\Delta D > 0.030$") ranges from 14 to 20 except for the top plate. Thus, 27 tubes is judged to provide a conservative estimate of the number of tubes that would experience a diametral change > 0.030" for Byron and Braidwood, except possibly for the top plate. More than 27 tubes were excluded from IPC application to accommodate uncertainty in defining the specific 27 tube locations.

For the top plate of Byron and Braidwood, the number of tubes affected was retained at approximately 27 tube locations, as it would be expected that LLB for the primary system would result in significantly fewer tubes affected than was obtained for the prior Model D3 analyses which were based on a large break LOCA event. For the large LOCA, the bounding range of affected tubes in the Model D3 analyses was in the range of 53 to 66 tubes. Analyses of another SG model, with LBB consideration, have shown a 2/3 reduction in the rarefaction wave-induced loads at the top TSP. A similar reduction in LOCA loads for the Model D4 SG would result in plate and wedge loads on the same order of magnitude as presently calculated for the lower plates. Given the LBB assumption for Byron and Braidwood with the associated reduction in loads, and the fact that few indications are found at the top plate, it is considered to be adequately conservative to use 27 tube locations to bound the exclusion area for IPC application in the top TSP.

Item C - NRC requested that the Staff be promptly notified by ComEd in the event that PWSCC indications are detected at tube support plates during the inspection at Byron Unit 1 (B1R06).

Response C - ComEd will promptly notify NRC of any PWSCC indications detected at tube supports plates during the steam generator inspections being conducted at Byron Unit 1.

Item D - NRC asked to be supplied with EFPY values for Byron Unit 1 Cycles 5 and 6 and the projected EFPY for Cycle 7.

Response D - Actual EFPY for Cycle 5 - 1.127
Actual EFPY for Cycle 6 - 1.278
Predicted EFPY for Cycle 7 - 1.3

As discussed during the Reference 4 teleconference, WCAP-14046 (Proprietary) and WCAP-14047 (Non-proprietary), "Braidwood Unit 1 Technical Support for Cycle 5 Steam Generator Interim Tube Plugging Criteria," Revision 1, are also applicable to Byron Station. These documents have been formally transmitted to the Staff via Reference 8.

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

Sincerely,

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

ATTACHMENT A
REFERENCES

1. August 1, 1994, letter from J. A. Bauer to W. T. Russell transmitting Byron Station's request for a license amendment to implement an Interim Plugging Criteria.

2. September 7, 1994, letter from J. A. Bauer to W. T. Russell transmitting a supplement to Byron Station's request for a license amendment to implement an Interim Plugging Criteria.

3. September 17, 1994, letter from D. M. Saccomando to W. T. Russell transmitting a supplement to Byron Station's request for a license amendment to implement an Interim Plugging Criteria.

4. September 16, 1994, teleconference between Nuclear Regulatory Commission (NRC) and Byron Station Staff regarding questions and issues related to Byron Station IPC submittal/supplements.

5. September 22, 1994, letter from D. M. Saccomando to W.T. Russell transmitting additional information regarding Byron Station IPC submittal/supplements.

6. September 28, 1994, teleconference between NRC Staff and Byron Station Staff regarding questions and issues related to Byron Station IPC submittal/supplements.

7. August 18,1994, letter from R. Assa to D. Farrar transmitting Safety Evaluation for Use of Interim Plugging Critieria for Braidwood Unit 1

8. September 2, 1994, letter from T. Simpkin to W.T. Russell transmitting WCAP-14046 Rev.1, "Braidwood Unit 1 Technical Support for Cycle 5 Steam Generator Interim Plugging Criteria" (Proprietary), and WCAP-14047, Rev.1, "Braidwood Unit 1 Technical Support for Cycle 5 Steam Generator Interim Plugging Criteria" (Non-proprietary)

ATTACHMENT B

VC SUMMER APPENDIX A/BYRON INSPECTION GUIDELINES
DIFFERENCES & RESOLUTIONS

V.C. SUMMER APPENDIX A/BYRON INSPECTION GUIDELINES DIFFERENCES & RESOLUTIONS

VC Summer Section	VC Summer Appendix A Guidelines Summary	Byron Section	Byron Original Inspection Guidelines Summary	Resolution *
A.2.2	Does not provide allowance for other RPC calibration standard configurations	A.2.3.2	Similar configurations which satisfy the intent of calibrating RPC probes for OD axial and circumferential cracking are satisfactory.	The Byron Guidelines have been revised to delete the allowance for similar configurations to match the VC Summer Guidelines.
A.2.2	Probe Wear Calibration Standard hole size to be 0.067" +/- 0.001"	A.2.3.1	Probe Wear Calibration Standard is 0.052" +/- 0.001"	Per the latest draft of the EPRI ODSCC Document, TR-100407, the 0.067" hole size is for 7/8" tubing and the 0.052" hole size is for 3/4" tubing. Since Byron has 3/4" tubing, the probe wear standard should contain 0.052" holes. No change has been made to Byron Guidelines.

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A.2.2	The bobbin coil calibration standard shall contain four 0.028" diameter TW holes, 90° apart in a single plane around the tube circumference; the hole diameter tolerance shall be +/- 0.001".	A.2.3.1	The bobbin coil calibration standard contains four 0.028" diameter TW holes, 90° apart in a single plane around the tube circumference; the hole diameter tolerance shall be +/- 0.001" (optional).	The four 100% TW holes are not used in the setups described in the VC Summer or Byron Guidelines and, therefore, are considered optional. The option pertains to the use of the four holes and not the 0.001" tolerance.
A.2.4	TSP intersections must be viewed at a span setting one-half or less that provides 3/4 full screen amplitude for 4x20% holes (bobbin) and 1/10 or less the corresponding span for 0.5" throughwall slot (RPC).	A.2.6.1	Specific span requirements are not defined in the Byron Guidelines	The Byron Guidelines have been revised to include span requirements to match the VC Summer Guidelines.
A.2.4	RPC frequencies should include 550 kHz, 300 kHz and 130 kHz.	A.2.5.1	RPC frequencies should include channels adequate for detection of OD degradation in the range of 100 kHz to 550 kHz, as well as a low frequency channel to support location of the TSP edges.	The Byron Guidelines allow for flexibility in the use of different probe coil sizes by specifying a range of acceptable RPC frequencies.

A.2.4	The "as-read" depth of the drilled holes should be determined from the 550 kHz differential channel. This should be achieved by setting the phase angle of the 100% drilled hole to 40° and then determining the "as-read depth" of the 60% and 20% drilled holes from the ZQA-4.1 curve.	A.2.6.1	Establish a phase versus depth calibration curve using measured signal phase angles in combination with the "as-built" flaw depths for the 100%, 60%, and 20% holes.	The use of the "as built" flaw depths is more accurate than the "as-read" depth from the ZQA-4.1 curve. Therefore, Byron continues to use the "as built" flaw depths. This is consistent with the Catawba and EPRI guidelines.
A.2.4	It is recommended that the absolute mode also be used, at test frequencies of 10 kHz and 35 kHz. The low frequency (35 kHz) channel should be recorded to provide a positive means of verifying TSP edge detection for flaw location purposes.	A.2.5.1	It is recommended that the absolute mode also be used at test frequencies of 10-35 kHz. The low frequency (10-35 kHz) channel should be recorded to provide a positive means of verifying TSP edge detection for flaw location purposes.	The use of lower frequencies (< 35kHz) can provide a better assessment of TSP edge location. Therefore, the Byron guidelines continue to specify a range of 10-35 kHz.
A.2.5	The 550 kHz differential signal rotation for the 100% TW hole should be set to 40° (+/- 1°)	6.1.3.a	The 550 kHz differential signal rotation for the 100% TW hole is set to 40° (+/- 2°)	The Byron Guidelines have been revised to the VC Summer requirement.

A.2.5.2)	The RPC amplitude shall be set to 20 volts for the 0.5 inch throughwall notch at 550 kHz and 300 kHz.	A.2.6.2	The RPC amplitude will be referenced to 20 volts for a 0.5 inch long 100% TW notch at 300 kHz.	The optimum RPC frequency for OD and ID flaw detection for the probes currently in use at Byron is in the range of 200-300 kHz. The flaw response at 550 kHz would be significantly reduced and a noise level increase could be observed. Therefore, the Byron Guidelines were not changed.
A.3.3	Includes a discussion of Copper Interference	A.3.4	The Byron Guidelines do not provide a discussion of copper interference.	Although Byron has not previously reported indications of copper deposits, the Byron Guidelines have been revised to provide a discussion of copper interference to match the VC Summer Guidelines.
A.3.5	Includes a discussion of dent interference	A.3.4	The Byron Guidelines do not contain a discussion of dent interference.	Although, Byron has not experienced significant corrosion assisted denting, the Byron Guidelines have been revised to provide a discussion on denting interference to match the VC Summer Guidelines.

A.3.6	In the event that a cicumferential indication is found at a support plate location, ultrasonic examination could be employed for verification.	A.3.5	The ultrasonic examination option is not discussed in the Byron Guidelines.	The decision to perform additional testing is determined by Site Engineering. Therefore, the UT option is not given in the analyst guidelines.
A.3.6	Includes a discussion of pitting and RPC results not readily identified with cracks.	A.3.5	The Byron Guidelines do not contain a discussion of pitting and RPC results.	The VC Summer guideline discussion provides information for dispositioning of flaws. Flaw disposition is performed by Byron Site Engineering. Therefore, this discussion is not included in the analyst guidelines.
A.3.7	Includes a discussion of Confinement of ODSCC/IGA Within the Support Plate Region with the bobbin coil	A.3.6	The Byron Guidelines do not provide a discussion of the bobbin coil technique to determine TSP confinement.	The Byron Guidelines have been revised to match the VC Summer Guidelines.
A.3.7	Includes a discussion of crack length determination by either the RPC Slope-Intercept or the scan line method	A.3.7	The Byron Guidelines include a discussion of the RPC scan line method to determine crack length	The Byron Guidelines have been revised to match the VC Summer Guidelines.

* Guideline revisions were made prior to the B1R06 SG inspection via a temporary change to the Guidelines. Analysts were trained on the revisions. Changes will be permanently incorporated after the outage.