Duke Response AGENDA FOR A TELECONFERENCE

On October 1, 2001 Duke Power Company discussed with the NRC staff the preliminary findings in the SG tube inspection a CNS Unit 2. During the teleconference, Duke Power discussed a signal at the hot leg top of tube sheet that was inspected by a plus point and an RG34 probe. The staff requests the following information regarding this signal:

1. Discuss "point-by-point" the engineering argument for the dispositioning of this signal during the current outage.

**Duke response**

The tube is row 21 column 75 in the C SG. The indication was located below the top of the tubesheet but above the expansion transition. The location was examined by rotating plus point and pancake before and after sludge lancing. The location was also examined with the R/D Tech RG3-4 probe.

The tube position is located in the sludge pile. Visual inspection of this area showed the remnants of a hard sludge pile with tenacious sludge on the tubes and some flake spalling. The sludge pile location could contribute to the potential for corrosion such as ODSCC but it also indicates that sludge deposits are present which could influence the eddy current signals.

The indication was called early in the outage. The indication was kept because it gave a response on the terrain plot for the 300 kHz and 200 kHz plus point circumferential channel. The 300 kHz and 200 kHz response appeared to have changed in voltage from previous year plus point inspection. The initial indication was questionable because it was at the flaw plane at 300 kHz but the rotation at 100 kHz indicated deposit. The plus point mix showed no response. The pancake coil had a response that indicated it was deposit. Other deposits were clearly visible in the eddy current data.

As a result of the call a conservative decision was made to expand to 100% inspection of the top of tubessheet in the C steam generator in accordance with industry guidelines. In addition, the 20 % sample was expanded to 100 % in the A and D steam generators. At the time of discovery the B steam generator was not available for inspection. Due the final disposition of the indication, the B steam generator sample remained at 20%. After a 100 % inspection of three steam generators and a 20% sample of one steam generator at the top of the tubesheet no other crack like indication were found. One would expect some confirmation of other indications if the signal represented actual degradation.

After sludge lancing, the signal formation had changed from a characteristic of a circumferential indication to that of a small volumetric indication due to deposits. All of the phases for all of the frequencies were outside the defect plane.

The RG3-4 is transmit- receive eddy current technology. The RG3-4 inspection was performed after sludge lancing. The signal to noise ratio appears to be much cleaner. As shown in the table in question 2, The RG3-4 was NDD because all phases were outside the defect plane.

After a review of the data by several QDA's Level III analysts and an EPRI representative, the indication was determined to be NDD (no defect detected) by the plus point, the pancake, and the RG3-4 probes. There were no other indications of cracking in any of the top of tubesheet inspections.

2. Provide identification of the tube that contain the signal in question (e.g. column and row) and the exact location of the signal in the tube relative to the bottom of the expansion transition zone.

**Duke response**
The tube is row 21 column 75 in the C steam generator. The indication was located below the top of the tubesheet but above the expansion transition. The signal is located 0.04 inches above the expansion transition and the top of tubesheet is located 0.05 inches above the expansion transition.

3. What were the amplitude and phase angle of the subject signal for the plus point probe during the current outage and during its previous inspection(s) and for the RG 34 probe during the current outage.

**Duke response**

| Coil/ | TTS Indication | | 60% ID Notch | | 20% ID Notch | | 60% OD Notch | | 20% OD Notch | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Volts | Phase | Volts | Phase | Volts | Phase | Volts | Phase | Volts | Phase |
| +Pt (3/00 RFO) | | | | | | | | | | |
| 300 kHz | 0.17 | 78 | 2.33 | 23 | 0.41 | 10 | 1.17 | 82 | 0.15 | 110 |
| 200 kHz | 0.29 | 52 | 3.00 | 21 | 0.50 | 9 | 1.77 | 66 | 0.23 | 89 |
| 100 kHz | 0.23 | 8 | 1.47 | 20 | 0.22 | 13 | 1.02 | 46 | 0.14 | 73 |
| +Pt (9/01 RFO) | | | | | | | | | | |
| 300 kHz | 0.14 | 109 | 2.86 | 20 | 0.30 | 9 | 0.91 | 94 | 0.13 | 109 |
| 200 kHz | 0.25 | 87 | 3.66 | 18 | 0.29 | 16 | 1.40 | 72 | 0.21 | 86 |
| 100 kHz | 0.13 | 69 | 1.76 | 17 | 0.18 | 10 | 0.85 | 50 | 0.14 | 59 |
| +Pt (9/01 RFO Post Sludge Lancing) | | | | | | | | | | |
| 300 kHz | 0.16 | 115 | 3.06 | 16 | 0.41 | 10 | 0.81 | 89 | 0.11 | 90 |
| 200 kHz | 0.29 | 107 | 4.05 | 16 | 0.58 | 7 | 1.26 | 72 | 0.19 | 95 |
| 100 kHz | 0.26 | 97 | 1.97 | 9 | 0.29 | 6 | 0.76 | 45 | 0.14 | 65 |
| RG 3-4 (9/01 RFO) | | | | | | | | | | |
| 400 kHz | 0.03 | 178 | 2.81 | 16 | 0.44 | 9 | 0.74 | 94 | 0.10 | 121 |
| 300 kHz | 0.05 | 144 | 1.63 | 17 | 0.23 | 11 | 0.29 | 95 | 0.06 | 100 |
| 200 kHz | 0.04 | 118 | 1.04 | 17 | 0.15 | 13 | 0.21 | 74 | 0.04 | 73 |
| 100 kHz | 0.02 | 77 | 0.48 | 18 | 0.06 | 14 | 0.12 | 52 | 0.02 | 61 |
| | | | | | | | | | | |

All other RPC data was reviewed and no signal was present prior to 3/00

4. For what previous inspections does RPC data exist for the subject signal?

**Duke response**
RPC inspection data exist for the subject location in 10/91, 2/93, 5/94, 10/95, 3/00, and 9/01 inspections. The plus point inspection began in 1998. All inspections contain a 0.115 pancake coil.

5. Did both primary and secondary analysts identify the signal during the current inspection? Discuss your analyst procedures (for plus point and RG 34) for dispositioning signals that both analysts identify as an indication.

**Duke response**
The signal was identified by the primary analyst, the secondary analyst did not call it. The signal then went to resolution. All discontinuity characterization codes are reviewed by resolution. If the initial resolution analyst changes a flaw like indication, the indication must be reviewed by a second resolution analyst. The resolution analyst are Level III QDA's.

6. Discuss why the signal was identified this outage and not during a previous outage.

**Duke response**

As discussed above the indication gave a response on the 300 kHz and 200 kHz plus point circumferential coil.

7. When would the next eddy current inspection occur for the SG with this signal?

**Duke Response**
All steam generators are currently planned to be inspected at the refueling outage at EOC 12. This signal location will be inspected at that time.

8. Do you plan to inspect this location during the next SG inspection and future outages? If so, what process tracks this signal (indication)?

**Duke Response**
The location will be inspected at the next refueling outage. The action will be tracked through our corrective action program. The indication will be subject to technical specification and industry requirements for future inspections.

9. Have you compared the subject signal with destructive examination data available through other industry experience (e.g., indications that have been confirmed through destructive examination and indications that were not confirmed through destructive examination)?

**Duke Response**
The post sludge lancing plus point response was very similar to the indication responses from a previous tube pull at another plant and was volumetric in nature as opposed to the original response which had some circumferential characteristics. The previous tube pull indicated that the signal was that of a shallow groove or scratch. After sludge lancing, the signal formation had changed from a characteristic circumferential indication to that of a small

volumetric indication due to deposits. The phases were outside the defect plane based 20 % OD EDM notch measurements.

10. Discuss detection capability (e.g., in terms of probability of detection or ETSS) between the +point examination and RG 34 examination.

**Duke Response**

| Probe | ETSS# | Qualified for | POD |
|---|---|---|---|
| Plus Point | 20409.1 | Detection:<br>Axial ODSCC @ support structures & freespan regions<br>Circumferential ODSCC @ expansion Transitions | 0.863 @ ≥ 50% TW |
| RG 3-4 | 20407.1 | Detection:<br>Axial ODSCC @ support structures & freespan regions | 0.825 @ ≥ 60% TW |
| RG 3-4 | 20406.1 | Detection:<br>Circumferential ODSCC @ TTS & Expansion transitions | 0.811 @ ≥ 42% TW |

Of course any qualification is dependent on the flaws that make up the data set. The qualification data sets have some of the same laboratory grown flaws in common. For the OD circumferential data set each technique detected all of the same flaws in common. For the OD axial data set the RG3-4 detected a 60 % TW flaw, the plus point did not, the plus point detected a 44 % TW and 50 % flaw the RG 3-4 did not and they both missed a 49 % TW and 22 % TW flaw.

11. Have you considered ultrasonic testing (UT) inspection of this tube for diagnostic purposes? If not, why not?

**Duke response**
UT was considered. UT is qualified for detection and sizing of axial and circumferential ODSCC but this equipment was not immediately available on site. The RG3-4 probe could be implemented immediately and provide timely information on characterization of potential defect. The RG3-4 is transmit-receive eddy current.

12. Provide the inspection data (plus point and RG34) of this signal in an optical disk for staff review.

**Duke response**
Duke requests that NRC consider sending their qualified eddy current analyst to MNS for data review. This way, any additional data could be immediately accessed by the reviewer and any questions answered in a more timely manner.

**TABLE 3 - Steam Generator Work Scope**

## CATAWBA Nuclear Station

**Unit: 2 EOC: 11**

| ACTIVITY | | Steam Generator A Planned | A Actual | B Planned | B Actual | C Planned | C Actual | D Planned | D Actual | BASIS / COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| **1.0** | **ECT Tube Examinations** | | | | | | | | | |
| | | | | | | | | | | |
| **1.1** | Bobbin (full length)<br><br>AVB WAR sized with bobbin.(ETSS 96004) | See Comment | 46% | See Comment | 42% | See Comment | 40% | See Comment | 46% | All tubes with previous indications, All tubes around plugged tubes, Periphery tubes two rows deep, 20% sample plan plus any tubes/indications not inspected since EOC8 (=5.09 EFPY). All tubes with incomplete inspections from EOC10. |
| | | | | | | | | | | |
| **1.2** | RPC Special Interest (+Point and Pancake)<br><br>TSP WAR seized with RPC.(ETSS 96911) | | 210 | | 105 | | 125 | | 193 | All IDI, ODI, new WAR plus any WAR with no previous RPC to characterize.<br>All ADI, NQI, PLP, RRC, DWI, PVN, CHT, BLG and IRR.<br>TSP WAR with no previous RPC.<br>DNG/DNT ≥ 5volts get 20% |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | sample. DNG/DNT from 2 to < 5 volts will get 20% sample of indications at TSP 08H. Plus any tubes with incomplete inspections from EOC10. |
| **1.3** | RPC Hot Leg TTS (+Point, PID with +point & pancake) | 20% | 100% | 20% | 20% | 20% | 100% | 20% | 100% | Extent of +2, -3 inches 20% sample plan plus any tubes/indications not inspected since EOC8. All tubes with incomplete inspections from EOC10. |
| | | | | | | | | | | |
| **1.4** | RPC U-Bend, Rows 1&2 (+Point ;1 high and 1 mid frequency) | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% sample plan plus any tubes/indications not inspected since EOC8. All tubes with incomplete inspections from EOC10. |
| | | | | | | | | | | |
| **1.5** | RPC Pre-Heat Expansions In 17th & 18th TSP (+Point, PID with +point & pancake) | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% sample plan plus any tubes/indications not inspected since EOC8. All tubes with incomplete inspections from EOC10. |
| | | | | | | | | | | |
| **2.0** | **ECT Plug** | | | | | | | | | |
| | | | | | | | | | | |
| **2.1** | RPC Rolled Plugs(Hot Leg) | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% sample plan plus any plugs not inspected since EOC8. |
| | | | | | | | | | | |
| | | | | | | | | | | |
| **3.0** | **Visual Plug Exams** | | | | | | | | | |
| | All Plugs | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | |
| | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|
| **4.0** | **Repairs** | | | | | | | | | |
| | Ribbed Plugs | 0 | | 0 | | 0 | | 0 | | |
| | Rolled Plug Removal | 0 | | 0 | | 0 | | 0 | | |
| | | | | | | | | | | |
| **5.0** | **Tube Plugging** | | | | | | | | | |
| | | | | | | | | | | |
| **5.1** | Rolled Plugs | | | | | | | | | |
| | New | | 0 | | 0 | | 0 | | 0 | Est. 10 tubes to plug. |
| | Replacements | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No Repairs required |
| | | | | | | | | | | |
| **5.2** | Stabilizers | | 0 | | 0 | | 0 | | 0 | Est. 3 tubes. |
| | | | | | | | | | | |
| **6.0** | **Other Tests (non-ECT)** | | | | | | | | | |
| | | | | | | | | | | |
| **6.1** | Bubble Test / Drip Test | No | No | No | No | No | No | No | No | |
| | At shutdown | | | | | | | | | |
| | Prior to start-up | No | No | No | No | No | No | No | No | |
| **6.2** | In-situ Pressure Test | | | | | | | | | Plan as contingency. (Budget Risk Item.) |
| | | | | | | | | | | |
| **6.3** | Tube Pull | No | No | No | No | No | No | No | No | Plan as contingency. (Budget Risk Item.) |
| | | | | | | | | | | |
| **7.0** | **Primary Maint/PM** | | | | | | | | | |
| | | | | | | | | | | |
| **7.1** | Manways | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Remove all 8 for ECT. Restore with new gaskets. |
| **7.2** | Nozzle dams | No | No | No | Yes | No | No | No | No | Split Pin Replacement Outage. Will use nozzle covers. |
| | | | | | | | | | | |
| **8.0** | **Secondary - Maint./PM** | | | | | | | | | |
| **8.1** | Sludge Lancing | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **8.2** | Inspection/FOSAR (Include an Upper-bundle inspection in 1 SG between 4th & 5th TSP.) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 1 SG pre-lance inspection with post-lance inspection in all 4 SG's. Includes annulus, tube free lane, and in bundle inspections. |
| **8.3** | Internals Inspection | * | | * | | * | | * | | * Inspect 1 SG between 4th and 5th support plates. |
| **8.4** | Manway refurbishment | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | |
| **8.5** | Restore Phono finish on Secondary Manways. | No | No | No | No | No | No | No | No | Plan as contingency (Budget risk item.) Not Budgeted |
| **8.6** | Insp. Cover refurbishment | # | | # | | # | | # | Yes | # Open one inspection port for 1 SG. To support insp between 4th and 5th support plate. |
| **9.0** | **Miscellaneous** | | | | | | | | | |
| | | | | | | | | | | |
| **9.1** | Nozzle Dam refurbishment | No | No | No | Yes | No | No | No | No | Nozzle Dam usage not planned with Split Pin work |
| | | | | | | | | | | |
| **9.2** | Audio/Video | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Normal support for 8 Channel Head Eddy Current exam. |
| **9.3** | RP Test Primary Inserts | | | | | | | | | RP will test inserts from 1 SG |
| | | | | | | | | | | |
| **9.4** | Manway/Cover Funct. | Yes | | Yes | | Yes | | Yes | | |
| | | | | | | | | | | |
| **9.5** | Penetration covers E-251, M-234, & M-452 | | | | | | | | | Pen covers will be R&R'ed for temporary flange installation. |
| | | | | | | | | | | |
| **9.6** | R&R two SG enclosure manways (1 from each side of bldg.) | | | | | | | | | Provide access to upper secondary covers. Requires advanced lift plan |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | for work from bucket. |
| | | | | | | | | | | |
| **9.7** | Clean-up/Inventory Equipment and Tools | Yes | | Yes | | Yes | | Yes | | |

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**SGM&E Comp. Eng.**

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**Reviewed by:** _____
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