Duke Energy®

D.M. JAMIL
Vice President

Catawba Nuclear Station
4800 Concord Rd. / CN01VP
York, SC 29745-9635

803 831 4251
803 831 3221 fax

May 15, 2006

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

Subject: Duke Power Company LLC d/b/a Duke Energy Carolinas, LLC (Duke)
Catawba Nuclear Station, Unit 1
Docket Number 50-413
Reply to Request for Additional Information Concerning Steam Generator Outage Summary 180-Day Report for End of Cycle 15 Refueling Outage

Reference: Letter from Duke Energy Corporation to NRC dated November 28, 2005

Please find attached Catawba's reply to the subject Request for Additional Information (RAI). The RAI was received on April 6, 2006 via electronic mail. The format of the attachment is to restate the RAI question, followed by our reply.

There are no regulatory commitments contained in this letter or its attachment.

If you have any questions concerning this material, please call L.J. Rudy at (803) 831-3084.

Very truly yours,

D.M. Jamil

LJR/s

Attachment

A001

xc (with attachment):

W.D. Travers, Regional Administrator
U.S. Nuclear Regulatory Commission, Region II
Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
Atlanta, GA 30303

E.F. Guthrie, Senior Resident Inspector
U.S. Nuclear Regulatory Commission
Catawba Nuclear Station

J.F. Stang Jr., Senior Project Manager (addressee only)
U.S. Nuclear Regulatory Commission
Mail Stop 8 H4A
Washington, D.C. 20555-0001

ATTACHMENT

REPLY TO NRC REQUEST FOR ADDITIONAL INFORMATION

REQUEST FOR ADDITIONAL INFORMATION
CATAWBA UNIT 1, CYCLE 15 STEAM GENERATOR TUBE INSERVICE INSPECTIONS
TAC NO. MC8256
DOCKET NO. 50-413

1. Please clarify the scope of your inspections. In your August 30, 2005 (ML052500494), submittal you indicated that the total number of tubes inspected with a bobbin probe in Steam Generator (SG) A, SG B, SG C, and SG D were 3761, 3775, 3740, and 3758. However, in your November 28, 2005 (ML053410182), submittal you indicated that 3761 tubes in SG A, 3776 tubes in SG B, 3735 tubes in SG C, and 3753 tubes in SG D were inspected with a bobbin probe. In addition, the total number of tubes inspected in each SG is reported differently for the array probe inspections. For example, the August 30, 2005, submittal indicates that 1618 tubes were inspected in SG A with an array probe while the November 28, 2005, submittal indicates that 1623 tubes were inspected in SG A.

Duke Response:

Minor differences in the number of tubes inspected as noted in the two referenced reports existed. This is due to how the data base was queried for tubes on multiple inspection plans. There were 3761 tubes inspected by bobbin full length in the A steam generator. There were 3775, 3740, and 3758 tubes inspected full length by bobbin in the B, C, and D steam generators, respectively.

To explain the example, the steam generator A array plan included 809 tubes that were examined from the first support plate down to the tubesheet for loose parts around the periphery of the bundle. Each tube's array data was analyzed on both the hot leg and the cold leg for a total count of 1618 inspections. In addition to the periphery array inspection, there were 5 tubes with previous indications near the hot leg tubesheet that required array analysis. This would give a total of 1623 array inspections for the A steam generator. However, one of the 5 tubes with previous indications is a periphery tube and was also counted in the 1618 periphery array inspection count.

Due to dent and dings being areas of increased stress, discuss the scope and results of any dent and ding exams

performed during the end-of-cycle (EOC) 15 SG tube inspections. Please include the number of dents/dings in each SG, whether there were any new dents/dings identified, whether any "anomalous" dent signals were identified, and the inspection criteria (i.e., greater than or equal to 2-volts).

Duke Response:

Degradation at dents and dings is not expected in the 690 thermally treated tubing in service for 6.5 EFPY. The array data was evaluated for all new dents or dings, identified by bobbin, to ensure that there were no other forms of degradation present. There are 7 dents in the A steam generator, 3, 2, and 4 dents in the B, C, and D steam generators, respectively. There were new dents identified, but they are not believed to be service induced. There were no "anomalous" dents or dings identified. The bobbin threshold for dent identification is 2.00 volts.

Please discuss the scope and results of any foreign object search and retrieval inspections which may have been conducted during the EOC 15 SG tube inspections. If any loose parts were left in the SGs, discuss whether analyses were performed to ensure that tube integrity would be maintained until the next inspection of these tubes. In addition discuss the scope and results of any secondary side inspections performed during this outage.

Duke Response:

Top of tubesheet visual inspections were performed in all steam generators. An analysis has been performed and determined that objects within 5 tube pitches from the bundle periphery might cause wear. There were no parts identified in either the A or D steam generators. There were 5 parts identified (gasket winding, machine turning, and small crimp of aluminum) in the B steam generator. There were 3 parts identified (all are small "S" shaped hooks) in the C steam generator. All parts identified were either small enough to move into the bundle into a lower flow region or fixed in place. There was also an inspection performed of the upper bundle at the seventh lattice grid. Nothing abnormal was noted.

2. On Page 1 of the November 28, 2005, submittal you indicated that no active degradation was identified in your SGs during the EOC 15 SG tube inspections based on the EPRI definition of active degradation which excludes loose part wear. The staff has found that the industry's definition of active degradation is misleading since tubes could have degradation that is progressing (or present on the tubes) but the degradation could be classified as "not active" (refer to ML010320218 and ML012200349). As a result, please confirm that other than wear at structures, that you did not find any service-induced indications (i.e., those not attributable to manufacturing) during your inspections.

Duke Response:

Tube wear at structures and loose part wear is the only form of service-induced degradation.

3. In Technical Specification (TS) Section 5.6.8.c, Nondestructive Evaluation Techniques, it was stated that bobbin and array probes were the only probes utilized during the EOC 15 SG tube inspections. Is it correct for the staff to assume that the mechanisms listed in the table are those degradation mechanisms that Catawba Unit 1 SG tubes are susceptible to? If this assumption is correct, why were probes not capable of finding the forms of degradation that the tubes are susceptible to used during the EOC 15 SG tube inspections (e.g., it appears that only the +Point™ and pancake coil are the only probes qualified to detect outside diameter (OD) intergranular attack at the expansion transition region and OD stress corrosion cracking at dents)?

Duke Response:

No, it is not correct for the staff to assume that the mechanisms listed in the table are those degradation mechanisms that Catawba Unit 1 tubes are susceptible to. The table lists all qualified techniques available for use on the Catawba Unit 1 steam generator tubing. Bobbin and array probe techniques were qualified for all forms of degradation which the tubes are expected to be susceptible to at this point of their service life. The +Point™, array (X-Probe™) and pancake coil are qualified for detection of intergranular stress corrosion cracking at expansion transitions and are considered to have equivalent detection

capabilities of potential IGA if it were to occur. The bobbin coil and +Point™ probes are qualified for ODSCC detection at dents.

4. TS Section 5.6.8.d, Location of Service Induced Indications, requires information pertaining to service induced indications. Your submittal indicated that Attachment 1 contains information regarding the service induced indications found during the EOC 15 SG tube inspections. However, it appears that Attachment 1 has more than service induced indications. Are the dents, HNI (history with no indication), and absolute drift indications service induced? If not, please provide a list of only the service induced indications. If any of the indications are not a result of wear at structures or loose parts, please discuss the causal mechanism. Changes in eddy current signals since the baseline inspection attributed to eddy current repeatability should not be reported.

Duke Response:

Attached are tables of the service induced indications.

5. To verify accurate TS inspection sampling requirements, please provide the effective full power years (EFPY) at the time of your first in-service inspection following SG replacement and the EFPY at the time of your EOC 12, 13, 14, and 15 SG tube inspections. In addition, what is the u-bend radius for Row 1 and the smallest u-bend radius (and associated row number)?

Duke Response:

The steam generators were replaced at End of Cycle (EOC) 9. The first in-service inspection was at EOC 10 with 1.12 EFPYs. Cycles 11, 12, 13, 14, and 15 had individual lengths of 1.18, 1.37, 1.41, 1.43, and 1.30 EFPYs, respectively. The row one u-bends have a radius of 3.973 inches. The smallest u-bend radius is 3.632 inches in row three.

6. With respect to the design criteria, is the tubesheet 26.63-inches without the cladding and were the tubes in Rows 1 through 27 stress relieved (full-length) after bending?

Duke Response:

The tubesheet is 26.63 inches thick without the cladding. Tubes in rows 1 through 22 were stress relieved (full length) after bending.

7. Please discuss whether all the tubes known to be in close proximity were inspected during this outage and provide the results of these inspections. Please discuss whether the number of tubes in close proximity has been increasing or decreasing with time.

Duke Response:

There are no tubes in close proximity.

Steam Generator A Service Induced Indications

ROW	COL	VOLTS	DEG	PCT	CHN	LOCATION		UTIL 1
49	82	0.17	82	6	P2	FB2	1.35	WAR
57	38	0.15	48	5	P2	FB3	1.09	WAR
61	70	0.3	75	13	P2	FB4	0.62	WAR
77	82	0.29	99	9	P2	FB5	-0.68	WAR
77	90	0.26	99	10	P2	FB5	-0.64	WAR
81	80	0.26	107	10	P2	FB7	-0.67	WAR
89	78	0.33	103	12	P2	FB5	-0.59	WAR
89	80	0.34	105	13	P2	FB5	-0.67	WAR
91	80	0.31	116	10	P2	FB6	1.72	WAR
91	84	0.25	99	9	P2	FB4	-0.73	WAR
92	79	0.35	92	13	P2	FB4	-0.53	WAR
94	81	0.21	111	8	P2	FB5	1.73	WAR
95	88	0.25	119	8	P2	FB4	-0.68	WAR
96	109	0.2	101	7	P2	FB5	1.26	WAR
101	78	0.35	123	13	P2	FB4	-1.67	WAR
103	78	0.31	0	10	P2	FB5	-0.56	WAR

Steam Generator B Service Induced Indications

ROW	COL	VOLTS	DEG	PCT	CHN	LOCATION		UTIL 1
66	73	0.31	96	10	P2	FB5	0.63	WAR
69	70	0.44	94	14	P2	FB4	1.38	WAR
74	83	0.36	116	11	P2	FB4	1.26	WAR
82	75	0.33	99	10	P2	FB4	-1.1	WAR
82	83	0.37	81	11	P2	FB4	1.16	WAR
86	83	0.43	87	13	P2	FB5	1.04	WAR
86	83	0.39	85	12	P2	FB4	1.29	WAR
89	60	0.29	86	10	P2	FB6	-1.23	WAR
91	70	0.28	74	10	P2	FB6	1.37	WAR
95	64	0.24	123	9	P2	FB5	-1.13	WAR
97	70	0.18	106	6	P2	FB8	1.98	WAR
97	70	0.39	102	12	P2	FB6	-1.18	WAR
97	70	0.61	100	18	P2	FB5	-1.28	WAR
98	83	0.57	85	17	P2	FB5	1.04	WAR
103	70	0.28	83	10	P2	FB4	-1.01	WAR

Steam Generator C Service Induced Indications

ROW	COL	VOLTS	DEG	PCT	CHN	LOCATION		UTIL 1
63	44	0.17	99	5	P2	FB4	-1.72	WAR
70	55	0.3	72	9	P2	FB5	-1.19	WAR
72	61	0.45	0	12	P2	FB5	1.59	WAR
73	62	0.17	0	6	P2	FB6	-0.69	WAR
74	65	0.2	0	5	P2	FB6	-1.94	WAR
74	65	0.23	0	6	P2	FB5	1.54	WAR
74	65	0.18	0	5	P2	FB4	0.62	WAR
74	87	0.44	0	12	P2	FB4	-1.77	WAR
75	60	0.5	82	14	P2	FB4	-1.13	WAR
75	60	0.27	107	8	P2	FB6	-0.7	WAR
75	62	0.61		15	P2	FB4	-0.67	WAR
75	76	0.6		16	P2	FB5	1.24	WAR
76	59	0.23	0	8	P2	FB6	-1.76	WAR
76	61	0.51		13	P2	FB5	1.59	WAR
77	68	0.23	0	6	P2	FB6	-0.59	WAR
79	60	0.28	103	8	P2	FB4	-0.89	WAR
79	62	0.31	0	8	P2	FB5	0.68	WAR
79	62	0.71	0	17	P2	FB4	-1.24	WAR
79	66	0.16	0	4	P2	FB8	0.81	WAR
79	80	0.18	0	6	P2	FB4	0.63	WAR
79	86	0.26	0	9	P2	FB6	-0.49	WAR
79	86	0.34	0	11	P2	FB5	-0.87	WAR
80	59	0.25	0	9	P2	FB5	1.71	WAR
80	81	0.39	0	11	P2	FB4	-1.11	WAR
83	76	1.02		23	P2	FB5	-0.6	WAR
85	62	0.2	0	7	P2	FB5	-0.69	WAR
85	64	0.31	0	8	P2	FB5	-0.65	WAR
85	76	0.91	0	25	P2	FB5	-1.15	WAR
86	59	0.28	78	8	P2	FB4	1.73	WAR
86	61	0.52	0	13	P2	FB5	-0.59	WAR
86	61	0.27	0	7	P2	FB4	-0.67	WAR
86	77	0.34	0	11	P2	FB8	0.69	WAR
90	87	0.51	0	14	P2	FB5	1.66	WAR
91	62	0.42	0	11	P2	FB5	0.62	WAR
91	62	0.38	0	10	P2	FB5	-0.67	WAR
91	62	0.24	0	6	P2	FB4	0.59	WAR
92	87	0.42	0	14	P2	FB5	-1.67	WAR
94	63	0.25	0	7	P2	FB6	-1.7	WAR
96	87	0.38	0	11	P2	FB5	1.63	WAR
96	87	0.28	0	8	P2	FB4	1.61	WAR
97	86	0.31	0	9	P2	FB6	-0.63	WAR
98	77	0.62	0	19	P2	FB5	-1.12	WAR

Steam Generator C Service Induced Indications (continued)

ROW	COL	VOLTS	DEG	PCT	CHN	LOCATION		UTIL 1
98	85	0.22	0	6	P2	FB5	-1.76	WAR
98	85	0.21	0	6	P2	FB4	1.87	WAR
98	85	0.17	0	5	P2	FB3	1.85	WAR
98	87	0.35	0	12	P2	FB6	-1.61	WAR
98	87	0.34	0	11	P2	FB5	-1.53	WAR
99	68	0.15	0	5	P2	FB7	-0.64	WAR
100	87	0.46	0	13	P2	FB4	1.66	WAR
101	78	0.51		14	P2	FB5	-1.68	WAR
101	78	0.49		13	P2	FB4	1.66	WAR
101	78	0.42		12	P2	FB4	-0.71	WAR
101	78	0.42		12	P2	FB4	-1.68	WAR
102	77	0.51	0	16	P2	FB7	-1.04	WAR
102	77	0.52	0	16	P2	FB5	-1.15	WAR
102	77	0.75	0	22	P2	FB4	-1.15	WAR
102	77	0.39	0	13	P2	FB3	0.98	WAR
102	83	0.3	0	10	P2	FB5	-1.64	WAR
102	87	0.45	0	14	P2	FB5	-1.67	WAR
104	75	0.2	0	6	P2	FB4	-0.65	WAR
106	69	0.39		10	P2	FB6	1.73	WAR
109	62	0.14	0	5	P2	FB4	-0.83	WAR

Steam Generator D Service Induced Indications

ROW	COL	VOLTS	DEG	PCT	CHN	LOCATION		UTIL 1
52	79	0.36	103	12	P2	FB5	-0.84	WAR
52	91	0.31	120	12	P2	FB4	-0.9	WAR
53	76	0.69	74	21	P2	FB4	1.66	WAR
57	66	0.67		20	P2	FB5	-1.23	WAR
62	95	0.08	83	4	P2	FB4	-0.93	WAR
66	85	0.37	104	14	P2	FB4	1.5	WAR
67	74	0.37	84	13	P2	FB5	0.51	WAR
69	74	0.32	0	13	P2	FB5	0.71	WAR
71	66	0.23	100	8	P2	FB5	1.49	WAR
77	66	0.13		6	P2	FB5	1.09	WAR
79	66	0.29	109	10	P2	FB5	1.58	WAR
80	73	0.59	0	22	P2	FB5	1.67	WAR
80	73	0.39	0	16	P2	FB4	1.36	WAR
81	68	0.44		16	P2	FB6	-1.75	WAR
81	68	0.38		15	P2	FB4	1.67	WAR
85	84	0.33	87	12	P2	FB5	-1.13	WAR
86	73	0.74	0	26	P2	FB5	1.62	WAR
86	73	0.6	0	22	P2	FB4	1.45	WAR
86	73	0.57	0	21	P2	FB6	-1.7	WAR
88	73	0.53	92	17	P2	FB5	1.6	WAR
89	62	0.31		12	P2	FB5	-0.56	WAR
90	69	0.33	115	12	P2	FB4	0.79	WAR
91	62	0.23	67	9	P2	FB5	-0.51	WAR
92	69	0.36	99	12	P2	FB4	0.65	WAR
92	73	0.44	0	16	P2	FB5	1.62	WAR
93	62	0.64	90	20	P2	FB5	-0.62	WAR
93	70	0.2		8	P2	FB6	-1.19	WAR
93	70	0.51	0	18	P2	FB5	-1.08	WAR
95	62	0.2	117	8	P2	FB5	-0.68	WAR
95	68	0.43	97	14	P2	FB7	-0.73	WAR
95	68	0.59	106	18	P2	FB5	-1.3	WAR
95	68	0.37	81	12	P2	FB3	-0.54	WAR
97	68	0.69	0	23	P2	FB5	-1.24	WAR
99	64	0.19		9	P2	FB5	1.7	WAR
100	69	0.34	62	13	P2	FB6	1.84	WAR
100	69	0.29	101	11	P2	FB5	0.68	WAR
101	80	0.38	92	15	P2	FB6	-0.99	WAR
108	71	0.21	81	8	P2	FB5	0.48	WAR
108	73	0.27	0	10	P2	FB4	1.45	WAR
110	65	0.24	107	9	P2	FB4	-1.66	WAR
110	65	0.37	0	14	P2	FB5	-1.21	WAR
113	64	0.24	109	9	P2	FB5	-1.63	WAR
114	61	0.39	0	15	P2	FB4	-1.12	WAR
114	69	0.23	102	9	P2	FB5	0.71	WAR
114	69	0.21	136	8	P2	FB4	1.47	WAR