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SUBJECT: Responds to 870420 telcon w/D Wigginton & C Tinkler re util 870210 request for ice condenser surveillance interval extension for facility Cycle 9.

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April 30, 1987
AEP:NRC:0967I

Donald C. Cook Nuclear Plant Unit No. 1
Docket No. 50-315
License No. DPR-58
ICE CONDENSER SURVEILLANCE INTERVAL EXTENSION
FOR UNIT 1 CYCLE 9

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555
Attn: H. R. Denton

Dear Mr. Denton:

This letter responds to the April 20, 1987 telephone conversation with Messrs. David Wigginton and Charles Tinkler of your staff. Mr. Tinkler asked a number of questions regarding our February 10, 1987 request (AEP:NRC:0967H) for an ice condenser surveillance interval extension for Unit 1 Cycle 9. The responses to those questions are given below.

Question 1. Were the ice weight calculations extrapolated to July 1, 1987, or July 31, 1987?

Response: The ice weight calculations were extrapolated to July 31, 1987.

Question 2. What is the date to which the surveillance interval extension is needed?

Response: We request an extension to July 31, 1987.

Question 3. How does the most recent weighing compare with the five most recent weighings?

Response: We have compared the most recent weight losses with the four previous weight losses and also with the average of the five most recent weight losses. Twenty-five percent of the bays and seventeen percent of the row groups had ice loss significantly greater in the most recent interval than in the previous intervals, at the 95% confidence level. These larger ice losses would not be expected in the present operating cycle, since few air-handling units have been out of operation recently. This is discussed further in the response to Question 4.

A001
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Question 4. What maintenance has been performed over previous weighing intervals?

Response: Although no major maintenance has been done in recent cycles, we have checked the number of air-handling units that were turned off and out of service during the most recent periods of plant operation. There are 60 air-handling units available by design. These units are frequently referred to as 30 pairs of 2 units, though each unit is independent with its own air intake, motor, and glycol chiller. The average number of units that were turned off during a particular month of operation is tabulated below.

Operating Period	Month/Year	Avg No. of Air Handling Units Turned Off
6/86 - 4/87	4/87	3
"	3/87	2
"	2/87	3
"	1/87	4
"	12/86	5
"	11/86	3
"	10/86	5
"	9/86	4
"	8/86	4
"	7/86	3
"	6/86	8
12/85 - 6/86	6/86	13
"	5/86	8
"	4/86	7
"	3/86	4
"	2/86	1
"	1/86	3
"	12/85	3
9/85 - 12/85	12/85	6
"	11/85	2
"	10/85	4
"	9/85	7
6/85 - 9/85	9/85	7
"	8/85	5
"	7/85	5
"	6/85	10
8/84 - 4/85	4/85	2
"	3/85	1
"	2/85	unavailable
"	1/85	1
"	12/84	1
"	11/84	1
"	10/84	2
"	9/84	3
"	8/84	3
8/83 - 8/84	8/84	5
"	7/84	5
"	6/84	3
"	5/84	3

"	4/84	4
"	3/84	3
"	2/84	4
"	1/84	3
"	12/83	6
"	11/83	4
"	10/83	6
"	9/83	3

There is some overlap in the operating periods, which results in different averages in the same month. Except for a few cases with a large number of units off, there seems to be no overt trend of fewer units off in recent cycles. The present operating cycle (6/86-4/87) seems to have fewer units off than did the previous cycle (12/85-6/86)--4 compared to 5.6. Other units that were operating may have had varying amounts of ice buildup on the air intake that reduces efficiency. Quantification of the ice buildup or reduced efficiency was not available.

The dates of the six most recent weighings are

06/02/86 to 06/05/86
12/03/85 to 12/06/85
09/03/85 to 09/04/85
04/15/85 to 07/19/85
07/25/84 to 08/27/84
07/18/83 to 09/12/83

The dates of the refueling outages are

06/27/87 - (Scheduled)
None in 1986
04/06/85 - 11/17/85
None in 1984
07/16/83 - 10/24/83

Question 5. Has there been any maintenance or ice replenishment since the last weighing?

Response: There has been no major maintenance and no ice replenishment since the last weighing. Air-handling units were discussed in response to Question 4. Ice was replenished during the refueling outages of April 6, 1985 to November 17, 1985 and July 16, 1983 to October 24, 1983. Ice is not added during ordinary surveillances, only during refueling outages.

Question 6. During the recent shutdown did plant personnel check to determine whether the Row 1 and Row 9 baskets were frozen in place?

Response: During the recent shutdown (April 8, 1987 to April 20, 1987) we did not check to determine whether Row 1 and Row 9 baskets were frozen in place. Due to the short outage period it was not possible to prepare to perform a T/S ice weighing without unnecessarily delaying our return to power.

Question 7. Why is it appropriate to use the average ice weight and subtract from it the upper limit of the 95% confidence interval of the average weight loss per year? What would be the effect of using the lower 95% confidence limit of the ice weight and subtract from that the average weight loss per year?

Response: To support our request for the surveillance extension we needed to determine the expected or average ice weight loss per year at a 95% confidence level. The weight loss then is the statistical variable determined from "as-left" and "as-found" weighings. The weight loss is the difference between the as-left and as-found weights, normalized to a weight loss/yr. These as-left and as-found weighings were treated as paired observations for each bay. The average ice weights were treated as data. This method of paired observations is discussed in R. E. Walpole's text, Introduction to Statistics, 2nd edition, and is quite appropriate for this analysis.

We did not believe there was reason to consider any additional statistical methods such as the lower 95% confidence level of ice weight and average weight loss. Responding to the staff's request, however, we have repeated the analysis using this technique and found that the projected ice weights for each bay and row-group are greater than the T/S limit of 1220 pounds. This technique is not as conservative as the method we used originally because the standard deviation of the ice weights is much less than the standard deviation of the ice weight losses.

We have also subtracted the most recent weight loss from the average ice weights. All ice weights projected to July 31, 1987 remained above the 1220 pound T/S limit. Furthermore, when the most recent ice weight losses were subtracted from the lower 95% confidence limit of ice weights there were two bays and one row group below the 1220 T/S limit, but none below the 1098 weight allowed by the T/S Bases. The projected ice condenser weight is greater than the minimum required for safe operation. The total ice weight extrapolated to July 31, 1987 was always greater than 2,590,000 pounds regardless of averaging technique. This is far greater than the 2,371,450 pound minimum required by T/Ss. The results of all these new calculations are in Attachment 1.

Question 8: Have there been any events at the plant since June 1986 such as the inadvertent opening of the lower inlet doors that would lead us to believe that the next surveillance will be different from any past surveillance or average of past surveillances?

Response: Our April 29, 1987 telephone conversation with D. C. Cook Plant ice condenser personnel indicated there have been no significant events such as door openings or defrosting that would affect melting or ice weights on the next surveillance. Air-handling units were discussed in response to Question 3.

Based on numerous ice weight samples and calculations, we are convinced that the Unit 1 ice condenser will have more than sufficient ice mass, with proper distribution, to completely mitigate the consequences of the design-basis accident.

The calculations used to support our previous submittal (AEP:NRC:0967H) treated any ice weight gains as zero ice weight losses instead of negative weight losses. This zero weight loss keeps the average weight loss higher, and we believed, would provide a more conservative prediction of ice weight for July 31, 1987. However, the zero weight loss approach results in a small standard deviation associated with the average weight loss, and for this reason gives a less conservative prediction of ice basket weight. The standard deviation associated with treating weight gains as negative weight losses is larger and results in the more conservative calculation, though the average weight loss is smaller.

We have repeated the ice weight predictions based on the average ice basket weight and the upper 95% confidence limit average weight loss, treating the weight gains as negative weight losses. The results are tabulated in Attachment 2. Table 1 lists the June 1986 as-left average ice basket weights and the expected weights on July 31, 1987 for each bay. All bays except Nos. 1, 7, 8, 10, and 24 are expected to have average basket weights above 1220 pounds at the lower 95% confidence level. Bays 1, 7, 8, 10, and 24 are expected to have average basket weights above 1098 pounds at the lower 95% confidence level.

Table 2 lists the June 1986 as-left average ice basket weights for each row-group required to be weighed by T/S 4.6.5.1.b.2 and the expected weights on July 31, 1987. All row-groups except Nos. 1-1, 1-2, 2-2, 4-1, 4-2, 4-3, and 9-3 are expected to have average basket weights above 1220 pounds at the lower 95% confidence level. These anticipated lower ice weights are a result of a statistical anomaly due to some relatively large weight gains in one other surveillance period. Two of the row-groups are below 1098 pounds at the lower 95% confidence level. They are Nos. 1-2 (1048 pounds) and Nos. 4-3 (1061 pounds). We believe these weights, although conservative, would not adversely affect public health and safety since the current FSAR analysis is based on a total ice mass of 2,000,000 pounds, which corresponds to an average ice basket weight of 1029 pounds.

Table 3 lists the total ice weight expected on July 31, 1987. The ice condenser is expected to have at least 2,400,000 pounds of ice at the lower 95% confidence level on July 31, 1987. This is well above the 2,371,450 pound limit of T/S 4.6.5.1.b.2 and 2,000,000 pound limit of the FSAR analysis. The total ice weights were calculated using the predicted average bay basket weights and the predicted average row-group basket weights at the lower 95% confidence level. The weights for Rows 3, 5, and 7 were estimated as the average of the two adjacent row-groups.

It was not necessary to repeat calculations which used the most recent ice weight losses, since using a zero weight loss instead of a negative weight loss (gain) is conservative. There is no standard deviation associated with the most recent weight loss, since it is treated as a single observation.

This document has been prepared following Corporate procedures which incorporate a reasonable set of controls to insure its accuracy and completeness prior to signature by the undersigned.

Very truly yours,

M. P. Alexich
Vice President

cm

Attachment

cc: John E. Dolan
W. G. Smith, Jr. - Bridgman
R. C. Callen
G. Bruchmann
G. Charnoff
NRC Resident Inspector - Bridgman
A. B. Davis - Region III Administrator

Attachment 1 to AEP:NRC:0967I

Ice Weight Tables

TABLE 1

Projected Ice Weights per Basket by Bay
Based on Lower 95% Confidence Level on Basket Weight

Bay	A	d	P
1	1361	46.0	1311
2	1436	2.1	1434
3	1439	3.6	1435
4	1413	28.5	1382
5	1346	41.5	1301
6	1345	28.8	1314
7	1332	67.6	1259
8	1380	51.3	1324
9	1382	54.9	1322
10	1345	44.5	1297
11	1410	16.1	1392
12	1363	37.5	1322
13	1391	35.5	1352
14	1389	33.0	1353
15	1398	21.9	1375
16	1388	49.2	1334
17	1422	43.9	1375
18	1420	23.1	1395
19	1408	8.0	1400
20	1377	26.3	1348
21	1387	42.6	1340
22	1410	36.5	1371
23	1435	32.9	1400
24	1388	116.2	1263
Projected Total Ice Weight			2,624,300

A - Average ice weight per basket (lbs) at the lower 95% confidence level. As-left June 1986.

d - Average ice weight loss per basket per year (lbs/yr) over the last 5 surveillances.

P - Projected ice weight per basket (lbs) on July 31, 1987. P = A-d(13/12).

TABLE 2

Projected Ice Weights Per Basket by Row-Group
Based on Lower 95% Confidence Level on Basket Weights

Row-Group	A	d	P
1-1	1309	63.4	1241
1-2	1384	81.3	1295
1-3	1501	36.2	1461
2-1	1342	30.4	1310
2-2	1410	41.6	1365
2-3	1447	37.0	1407
4-1	1340	52.0	1284
4-2	1332	41.6	1287
4-3	1367	69.7	1292
6-1	1459	20.4	1437
6-2	1480	13.5	1466
6-3	1418	30.2	1386
8-1	1426	51.4	1371
8-2	1405	49.0	1352
8-3	1417	59.6	1352
9-1	1393	35.0	1356
9-2	1454	74.4	1374
9-3	1417	106.4	1301
Projected Total Ice Weight			2,631,800*

A = Average ice weight per basket (lbs) at the lower 95% confidence level. As-left June 1986.

d = Average ice weight loss per basket per year (lbs/yr) over the last 5 surveillances.

P = Projected ice weight per basket (lbs) on July 31, 1987.
P = A-d(13/12).

*Averaged Row-Groups 3, 5 and 7 by 2+4, 4+6 and 8+6, respectively.

TABLE 3

Projected Ice Weights Per Basket by Bay
Based on Most Recent Ice Weight Loss

Bay	Y	A	d5	P1	P2
1	1387	1361	226	1142*	1117*
2	1480	1436	0	1480	1436
3	1483	1439	0	1483	1439
4	1471	1413	10	1461	1403
5	1407	1346	146	1248	1187*
6	1391	1345	52	1334	1288
7	1380	1332	78	1295	1247
8	1434	1380	0	1434	1380
9	1436	1382	0	1436	1382
10	1410	1345	88	1314	1249
11	1472	1410	22	1449	1387
12	1423	1363	114	1299	1239
13	1433	1391	122	1300	1258
14	1435	1389	82	1347	1301
15	1452	1398	36	1413	1359
16	1440	1388	88	1344	1292
17	1451	1422	28	1420	1389
18	1469	1420	2	1466	1417
19	1456	1408	28	1425	1377
20	1491	1377	0	1491	1377
21	1432	1387	66	1360	1315
22	1454	1410	62	1386	1342
23	1482	1435	0	1482	1435
24	1430	1388	2	1428	1386
Projected Total Ice Weight				2,692,200	2,592,200

Y = Average ice weight per basket (lbs) as-left June 1986.

A = Average ice weight per basket (lbs) at the lower 95% confidence level. As-left June 1986.

d5 = Most recent ice weight loss per basket per year (lbs/yr).

P1 = Projected ice weight per basket on July 31, 1987 based on Y, P1=Y-d5(13/12).

P2 = Projected ice weight per basket on July 31, 1987 based on A, P2=A-d5(13/12).

*Below 1220 lbs. but above 1098 lbs.

TABLE 4

Projected Ice Weights Per Basket by Row-Group
Based on Most Recent Ice Weight Loss

Row-Group	Y	A	d5	P1	P2
1-1	1397	1309	110	1277	1189*
1-2	1437	1384	14	1421	1368
1-3	1578	1501	0	1578	1501
2-1	1392	1342	86	1298	1248
2-2	1439	1410	50	1384	1355
2-3	1467	1447	0	1467	1447
4-1	1356	1340	22	1332	1316
4-2	1352	1332	98	1245	1225
4-3	1391	1367	0	1391	1367
6-1	1469	1459	48	1417	1407
6-2	1502	1480	30	1469	1447
6-3	1445	1418	36	1406	1379
8-1	1451	1426	60	1386	1361
8-2	1430	1405	112	1308	1283
8-3	1441	1417	34	1404	1380
9-1	1447	1393	96	1343	1289
9-2	1484	1454	50	1429	1399
9-3	1450	1417	16	1532	1399
Projected Total Ice Weight				2,690,700	2,630,700

Y = Average ice weight per basket (lbs) as-left June 1986.

A = Average ice weight per basket (lbs) at the lower 95% confidence level. As-left June 1986.

d5 = Most recent ice weight loss per basket per year (lbs/yr).

P1 = Projected ice weight per basket on July 31, 1987 based on Y, P1=Y-d5(13/12).

P2 = Projected ice weight per basket on July 31, 1987 based on A, P2=A-d5(13/12).

*Below 1220 lbs. but above 1098 lbs.

**Averaged Row-Groups 3, 5 and 7 by 2+4, 4+6 and 8+6, respectively.

Attachment 2 to AEP:NRC:0967I

Ice Weight Tables
Weight Gains Treated as Negative Losses

TABLE 1
Average Ice Weights per Basket by Bay

Bay No.	Average Ice Weight/ Basket As Left June 1986 (lbs.)	Expected Ice Weight/ Basket July 1987 (lbs.)	Expected Ice Weight/ Basket at Lower 95% Conf. Level July 1987 (lbs.)
1	1387	1435	1170
2	1480	1529	1477
3	1483	1531	1440
4	1471	1521	1332
5	1407	1437	1244
6	1391	1400	1267
7	1380	1372	1108
8	1434	1462	1185
9	1436	1441	1232
10	1410	1457	1159
11	1472	1490	1415
12	1423	1451	1273
13	1433	1457	1280
14	1435	1453	1284
15	1452	1491	1303
16	1440	1431	1267
17	1451	1460	1259
18	1469	1515	1293
19	1456	1480	1398
20	1491	1541	1355
21	1432	1434	1283
22	1454	1460	1317
23	1482	1522	1221
24	1430	1313	1129

TABLE 2
Expected Average Ice Weights per Basket by Row-Group

Row No. Group No.	Average Ice Weight/ Basket As Left June 1986 (lbs.)	Expected Ice Weight/ Basket July 1987 (lbs.)	Ice Weight/ Basket at Lower 95% Conf. Level July 1987 (lbs.)
1-1	1397	1419	1148
1-2	1437	1474	1048
1-3	1578	1666	1357
2-1	1392	1426	1272
2-2	1439	1517	1178
2-3	1467	1501	1271
4-1	1356	1385	1102
4-2	1353	1399	1183
4-3	1391	1426	1061
6-1	1469	1479	1374
6-2	1502	1517	1448
6-3	1446	1427	1358
8-1	1451	1440	1288
8-2	1430	1396	1284
8-3	1441	1389	1259
9-1	1447	1431	1341
9-2	1484	1450	1255
9-3	1450	1339	1161

TABLE 3
Total Ice Weight Expected on July 31, 1987

Based on Average Ice Basket Weights		Based on Average Ice Basket Weights at the Lower 95% Confidence Level	
By Bay	By Row-Group	By Bay	By Row-Group
2,841,800	2,811,500	2,480,100	2,422,900

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April 29, 1987

DOCKET NO(S). 50-315/316
Mr. John Dolan, Vice President
Indiana and Michigan Electric Company
c/o American Electric Power Service Corporation
1 Riverside Plaza
Columbus, OH 43216

SUBJECT: DONALD C. COOK NUCLEAR PLANTS

The following documents concerning our review of the subject facility are transmitted for your information.

- [ ] Notice of Receipt of Application, dated _____.
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- [ ] Notice of Availability of Draft/Final Environmental Statement, dated _____.
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- [ ] Environmental Assessment and Finding of No Significant Impact, dated _____.
- [ ] Notice of Consideration of Issuance of Facility Operating License or Amendment to Facility Operating License, dated _____.
- [x] Bi-Weekly Notice; Applications and Amendments to Operating Licenses Involving No Significant Hazards Considerations, dated Apr 22,87' [*see page(s)*] _____.
- [ ] Exemption, dated _____.
- [ ] Construction Permit No. CPPR-_____, Amendment No. _____ dated _____.
- [ ] Facility Operating License No. _____, Amendment No. _____ dated _____.
- [ ] Order Extending Construction Completion Date, dated _____.
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Office of Nuclear Reactor Regulation

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