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AUTH.NAME AUTHOR AFFILIATION
TUCKER,H.B. Duke Power Co.
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SUBJECT: Forwards response to NRC Bulletin 90-001, "Loss of Fill-Oil in Transmitters Mfg by Rosemount," dtd 900309.

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Duke Power Company
P.O. Box 33198
Charlotte, N.C. 28242

Hal B. Tucker
Vice President
Nuclear Production
(704)373-4531

DUKE POWER

August 10, 1990

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

Subject: Oconee Nuclear Station, Units 1, 2, and 3
Docket Nos. 50-269, -270, -287
McGuire Nuclear Station, Units 1 and 2
Docket Nos. 50-369, -370
Catawba Nuclear Station, Units 1 and 2
Docket Nos. 50-413, -414
Response to NRC Bulletin No. 90-01
Loss of Fill-Oil in Transmitters Manufactured by Rosemount

Gentlemen:

The purpose of this letter is to submit Duke Power Company's (Duke's) response (Attachment 1) to the NRC Bulletin 90-01, "Loss of Fill-Oil in Transmitters Manufactured by Rosemount", dated March 9, 1990. This response is submitted for all Duke's nuclear plants; Oconee Nuclear Station, McGuire Nuclear Station, and Catawba Nuclear Station.

The subject bulletin requested that addressees promptly identify and take appropriate corrective actions for Model 1153 Series B, Model 1153 Series D and Model 1154 transmitters manufactured by Rosemount that may be leaking fill-oil. The bulletin identified five action items to be taken for operating reactors. A discussion of the activities undertaken by Duke to address the bulletin Action Items is provided in Attachment 1.

Our review of the Rosemount Model 1153 Series B, Model 1153 Series D and Model 1154 transmitters indicate that no suspect lot transmitters are installed in Reactor Protection System, Engineered Safety Features Actuation System or ATWS applications at any Duke Power nuclear station. However, three suspect lot transmitters are installed in safety related applications, two at Catawba Nuclear Station and one at McGuire Nuclear Station. Also, there are three suspect lot transmitters available as spares for safety-related applications at Catawba Nuclear Station. Corrective actions have been taken to ensure operability of suspect lot transmitters in safety-related applications. The remaining transmitters from the suspect lot at Catawba and McGuire Nuclear Stations identified in the attached response are either installed in non-safety applications or are available for use as non-safety spares. There have been no suspect lot transmitters supplied to Oconee Nuclear Station.

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Additionally, our review indicates that the failure rate of the Rosemount transmitters due to loss of fill-oil is low at Duke Power's nuclear stations. Only two transmitters have been confirmed to have failed in this manner; one at Catawba Unit 2 and another at McGuire Unit 1. These two transmitters were replaced. Also, three transmitters were found to have exhibited excessive drift during the review of the last three calibration cycles for Catawba transmitters. However, these transmitters were tested with no indication of loss of fill-oil, and have been returned to service.

As requested by Action Item 4, Duke has developed and instituted an enhanced monitoring program for nuclear safety-related Rosemount Model 1153 Series B, Model 1153 Series D, and Model 1154 transmitters at all three stations. The elements of this program are described under our response to Action Item 4 of the bulletin. As part of this program, Duke will implement a long-term computer-based trending program for Rosemount Models 1153 Series B and D and Model 1154 transmitters used in safety-related applications, including those transmitters manufactured after July 11, 1989. Another element of this program is the enhanced surveillance of safety-related Model 1153 Series B, Model 1153 Series D and Model 1154 transmitters manufactured prior to July 11, 1989 for any symptoms of loss of fill-oil. The enhanced monitoring program will continue until sufficient data is obtained by Duke to demonstrate there is no longer a need for continuation of this program. Implementation of our enhanced monitoring program will adequately address the problem of fill-oil loss in Rosemount transmitters and should minimize the chance of a transmitter failure due to oil loss being undetected.

NRC Bulletin 90-01 encouraged that enhanced surveillance be implemented for Model 1151, Model 1152, and Model 1153 Series A transmitters used in safety-related applications or in applications with an Anticipated Trip Without Scram (ATWS) function. However, there are no Model 1151 transmitters installed in such applications at any of Duke Power Company's Nuclear Stations. Therefore, these transmitters are not included in the enhanced Monitoring Program.

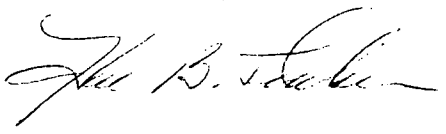
The presence of an elastometric O-ring seal in the sensor module in Model 1152 and Model 1153 Series A in lieu of the stainless steel O-ring used in Model 1153 Series B, Model 1153 Series D and Model 1154 transmitters, reduces the likelihood of oil loss in the sensor module. Also, there have not been oil loss failures of Model 1152 or 1153 Series A instruments at Duke Power. These transmitters have operated for many years with no problem. Therefore, they have not been included in our enhanced monitoring program. The exclusion of these transmitters from the enhanced monitoring program will keep the program from becoming too much of a burden on our stations' resources.

As a participant on the NUMARC Advisory Committee on this issue, Duke has been involved in an industry-wide effort to develop approaches to address the concerns of NRC Bulletin 90-01. Duke will continue to carefully monitor this situation through its enhanced monitoring program and its involvement

with NUMARC activities to ensure that the continued operation of these transmitters will not adversely impact the safe operation of our plants. Also, any failure of NPRDS-reportable transmitters will be reported to NPRDS. Those failures known to be due to loss of fill-oil will be reported as such.

I declare under penalty of perjury that the statements set forth herein are true and correct to the best of my knowledge.

Very truly yours,



Hal B. Tucker

MAH/113/lcs

Attachments

xc: Mr. S. D. Ebneter, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Mr. L. A. Wiens
Office of NRR
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. Darl S. Hood
Office of NRR
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dr. K. N. Jabbour
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
One White Fline North
Mail Stop 14H25
Washington, D.C. 20555

Mr. P. H. Skinner
NRC Resident Inspector
Oconee Nuclear Station

Mr. P. K. VanDoorn
NRC Resident Inspector
McGuire Nuclear Station

Mr. W. T. Orders
NRC Resident Inspector
Catawba Nuclear Station

Attachment 1

Duke Power Company
Response to NRC Bulletin 90-01
Loss of Fill-Oil in Transmitters Manufactured by Rosemount

Note: Responses under "Duke's Response" are intended for Oconee Nuclear Station, McGuire Nuclear Station, and Catawba Nuclear Station. Any plant specific information is identified within responses where applicable.

DUKE POWER COMPANY
RESPONSE TO NRC BULLETIN 90-01
LOSS OF FILL-OIL IN TRANSMITTERS MANUFACTURED BY ROSEMOUNT

Action Item 1

"Identify Model 1153 Series B, 1153 Series D, and Model 1154 pressure or differential pressure transmitters, excluding Model 1153 Series B, 1153 Series D, and Model 1154 transmitters manufactured by Rosemount subsequent to July 11, 1989, that are currently utilized in either safety-related systems or systems installed in accordance with 10 CFR 50.62 (the ATWS rule)."

Duke's Response:

All safety-related Rosemount Model 1153 Series B, 1153 Series D, and Model 1154 transmitter installations have been identified at Catawba, McGuire, and Oconee Nuclear Stations. This includes those Rosemount transmitters manufactured after July 11, 1989. These transmitters are listed by tag number and application description in the following tables 1, 2 and 3, respectively. There are no Rosemount transmitters utilized in ATWS applications at any Duke Power nuclear station.

Table 1
SAFETY-RELATED ROSEMOUNT MODEL 1153 AND 1154 TRANSMITTERS
DUKE POWER COMPANY
CATAWBA NUCLEAR STATION

TAG #	MODEL #	APPLICATION
CN1CAFT5040	1153DB5	Turbine Driven Auxiliary Feedwater Pump Discharge Flow
CN1CAFT5120	1153DB5	Auxiliary Feedwater Flow to Steam Generator (S/G)#D
CN1KCFT5530	1153DB4	Component Cooling (KC) Header A Inlet Flow
CN1KCFT5531	1153DB4	KC Header A Inlet Flow
CN1KCFT5540	1153DB4	KC Header B Inlet Flow
CN1KCFT5541	1153DB4	KC Header B Inlet Flow
CN1LDPT5142	1153GB7	Diesel Generator (D/G)A Lube Oil (LD) Inlet Pressure
CN1LDPT5143	1153GB7	D/G A LD Inlet Pressure
CN1LDPT5144	1153GB7	D/G B LD Inlet Pressure
CN1LDPT5172	1153GB7	D/G B LD Inlet Pressure
CN1LDPT5173	1153GB7	D/G B LD Inlet Pressure
CN1LDPT5174	1153GB7	D/G B LD Inlet Pressure
CN1NSPT5370	1153DB6	Containment Pressure Train A
CN1NSPT5380	1153DB6	Containment Pressure Train B
CN1NVLT5740	1153DB4	Boric Acid Tank Level Channel #1
CN1NVLT6070	1153DB4	Boric Acid Tank Level Channel #4
CN1RNFT5800	1153DB4	Containment Spray (NS) Header A RN Outlet Flow
CN1RNFT5850	1153DB4	NS Header B Nuclear Service Water (RN) Outlet Flow
CN2CAFT5040	1153DB5	Turbine Driven Auxiliary Feedwater Pump Discharge Flow
CN2KCFT5530	1153DB4	KC Header A Inlet Flow
CN2KCFT5531	1153DB4	KC Header A Inlet Flow
CN2KCFT5540	1153DB4	KC Header B Inlet Flow
CN2KCFT5541	1153DB4	KC Header B Inlet Flow
CN2LDPT5142	1153GB7	D/G A LD Inlet Pressure
CN2LDPT5143	1153GB7	D/G A LD Inlet Pressure
CN2LDPT5144	1153GB7	D/G A LD Inlet Pressure
CN2LDPT5172	1153GB7	D/G B LD Inlet Pressure
CN2LDPT5173	1153GB7	D/G B LD Inlet Pressure
CN2LDPT5174	1153GB7	D/G B LD Inlet Pressure
CN2NSPT5370	1153DB6	Containment Pressure Train A
CN2NSPT5380	1153DB6	Containment Pressure Train B
CN2NVLT5740	1153DB4	Boric Acid Tank Level Channel #1
CN2NVLT6070	1153DB4	Boric Acid Tank Level Channel #2
CN2RNFT5800	1153DB4	NS Header A RN Outlet Flow
CN2RNFT5850	1153DB4	NS Header B RN Outlet Flow

Table 2
SAFETY-RELATED ROSEMOUNT MODEL 1153 AND 1154 TRANSMITTERS
DUKE POWER COMPANY
McGUIRE NUCLEAR STATION

TAG #	MODEL #	APPLICATION
MC1CAFT5091	1153DD5	Auxiliary Feedwater (CA) Flow to S/G #A
MC1CAFT5101	1153DD5	CA Flow to S/G #B
MC1CAFT5111	1153DD5	CA Flow to S/G #C
MC1CAFT5121	1153DD5	CA Flow to S/G #D
MC1NCPT5120	1153GD9	Reactor Coolant (NC) Hot Leg #D Wide Range Pressure
MC1NSPT5360	1153DB4	Containment Pressure Train B
MC1NSPT5370	1153DB4	Containment Pressure Train A
MC1NSPT5380	1153DB4	Containment Pressure Train B
MC1NSPT5390	1153DB4	Containment Pressure Train A
MC1NSPT5490	1153DB4	Containment Pressure Train B
MC1NSPT5500	1153DB4	Containment Pressure Train A
MC1NSPT5510	1153DB4	Containment Pressure Train B
MC1NSPT5520	1153DB4	Containment Pressure Train A
MC1SMPT5080	1153GD9	S/G #A Steam Line Pressure Channel #1
MC1SMPT5120	1153GD9	S/G #B Steam Line Pressure Channel #2
MC1SMPT5150	1153GD9	S/G #C Steam Line Pressure Channel #2
MC1SMPT5170	1153GD9	S/G #D Steam Line Pressure Channel #1
MC1SMPT5210	1153GB8	Turbine Impulse Pressure
MC1SMPT5220	1153GB8	Turbine Impulse Pressure
MC2CAFT5091	1153DD5	CA Flow to S/G #A
MC2CAFT5101	1153DD5	CA Flow to S/G #B
MC2CAFT5111	1153DD5	CA Flow to S/G #C
MC2CAFT5121	1153DD5	CA Flow to S/G #D
MC2NCPT5120	1153GD9	NC Hot Leg #D Wide Range Pressure
MC2NSPT5360	1153DB4	Containment Pressure Train B
MC2NSPT5370	1153DB4	Containment Pressure Train A
MC2NSPT5380	1153DB4	Containment Pressure Train B
MC2NSPT5390	1153DB4	Containment Pressure Train A
MC2NSPT5490	1153DB4	Containment Pressure Train B
MC2NSPT5500	1153DB4	Containment Pressure Train A
MC2NSPT5510	1153DB4	Containment Pressure Train B
MC2NSPT5520	1153DB4	Containment Pressure Train A
MC2SMPT5080	1153GD9	S/G #A Steam Line Pressure Channel #1
MC2SMPT5090	1153GD9	S/G #A Steam Line Pressure Channel #2
MC2SMPT5100	1153GD9	S/G #A Steam Line Pressure Channel #4
MC2SMPT5110	1153GD9	S/G #B Steam Line Pressure Channel #1
MC2SMPT5120	1153GD9	S/G #B Steam Line Pressure Channel #2
MC2SMPT5130	1153GD9	S/G #B Steam Line Pressure Channel #3
MC2SMPT5140	1153GD9	S/G #C Steam Line Pressure Channel #1
MC2SMPT5150	1153GD9	S/G #C Steam Line Pressure Channel #2
MC2SMPT5160	1153GD9	S/G #C Steam Line Pressure Channel #3
MC2SMPT5170	1153GD9	S/G #D Steam Line Pressure Channel #1
MC2SMPT5180	1153GD9	S/G #D Steam Line Pressure Channel #2
MC2SMPT5190	1153GD9	S/G #D Steam Line Pressure Channel #4
MC2SMPT5210	1153GB8	Turbine Impulse Pressure
MC2SMPT5220	1153GB8	Turbine Impulse Pressure

TABLE 3
SAFETY-RELATED ROSEMOUNT MODEL 1153 AND 1154 TRANSMITTERS
DUKE POWER COMPANY
OCONEE NUCLEAR STATION

TAG#	MODEL #	APPLICATION
OC1C__LT0036	1153DB4	Upper Surge Tank Level Train A
OC1C__LT015A	1153DB4	Upper Surge Tank Level Train B
OC1FDWLT0066	1154DP5	SSF S/G #A Level
OC1FDWLT0067	1154DP5	SSF S/G #B Level
OC1FDWLT0080	1154DP5	S/G #A Level Train A
OC1FDWLT0081	1154DP5	S/G #B Level Train A
OC1FDWLT0082	1154DP5	S/G #A Level Train B
OC1FDWLT0083	1154DP5	S/G #B Level Train B
OC1HPIFT0157	1154HP4	SSF Reactor Coolant (RC) Makeup Pump Flow
OC1HPIFT0159	1153HB6	High Pressure Injection (HPI) Pump Flow
OC1HPIFT0160	1153HB6	HPI Pump Flow
OC1HPIPT0223	1154GP6	SSF RC Makeup Pump Suction Pressure
OC1HPIPT0227	1154GP9	SSF RC Makeup Pump Discharge Pressure
OC1LPILT0002A	1153DB5	Borated Water Storage Tank Level
OC1LPTLT0006	1153DB5	Borated Water Storage Tank Level
OC1LPILT0132	1153DB5	Borated Water Storage Tank Level
OC1RC_FT014B	1154HP6	Reactor Coolant (RC) Flow Loop A
OC1RC_FT014C	1154HP6	RC Flow Loop A
OC1RC_FT014D	1154HP6	RC Flow Loop A
OC1RC_FT014E	1154HP6	RC Flow Loop A
OC1RC_FT015B	1154HP6	RC Flow Loop B
OC1RC_FT015C	1154HP6	RC Flow Loop B
OC1RC_FT015D	1154HP6	RC Flow Loop B
OC1RC_FT015E	1154HP6	RC Flow Loop B
OC1RCLT0072	1154HP5	SSF Pressurizer Level
OC1RC_PT021P	1153GD9	RC Loop A Pressure - Wide Range
OC1RC_PT022P	1153GD9	RC Loop B Pressure - Wide Range
OC1FC_PT0224	1154GP9	Pressurizer Pressure
OC1RC_PT0225	1154GP9	RC Loop A Pressure
OC1RC_PT0226	1154GP9	RC Loop B Pressure
OC1RC_PT023P	1153GD9	RC Loop A Pressure - Wide Range
OC2C__LT0015A	1153DB4	Upper Surge Tank Level Train B
OC2C__LT0036	1153DB4	Upper Surge Tank Level Train A
OC2FDWLT0066	1154DP5	SSF S/G #A Level
OC2FDWLT0067	1154DP5	SSF S/G #B Level
OC2FDWLT0080	1154DP5	S/G #A Level Train A
OC2FDWLT0081	1154DP5	S/G #B Level Train A
OC2FDWLT0082	1154DP5	S/G #A Level Train B
OC2FDWLT0083	1154DP5	S/G #B Level Train B
OC2HPIFT0157	1154HP4	SSF RC Makeup Pump Flow
OC2HPIFT0159	1153HB6	HPI Pump Flow
OC2HPIFT0160	1153HB6	HPI Pump Flow
OC2HPIPT0223	1154GP6	SSF RC Makeup Pump Suction Pressure
OC2HPIPT0227	1154GP9	RC Makeup Pump Discharge Pressure

Table 3 (cont'd)

TAG #	MODEL #	APPLICATION
OC2LPILT0006	1153DB5	Borated Water Storage Tank Level
OC2LPILT002A	1153DB5	Borated Water Storage Tank Level
OC2LPILT0132	1153DB5	Borated Water Storage Tank Level
OC2RC_FT014B	1154HP6	RC Flow Loop A
OC2RC_FT014C	1154HP6	RC Flow Loop A
OC2RC_FT014D	1154HP6	RC Flow Loop A
OC2RC_FT014E	1154HP6	RC Flow Loop A
OC2RC_FT015B	1154HP6	RC Flow Loop B
OC2RC_FT015C	1154HP6	RC Flow Loop B
OC2RC_FT015D	1154HP6	RC Flow Loop B
OC2RC_FT015E	1154HP6	RC Flow Loop B
OC2RC_LT0072	1154HP5	SSF Pressurizer Level
OC2RC_PT017P	1154GP9	RC Loop A Pressure - Narrow Range
OC2RC_PT018P	1154GP9	RC Loop A Pressure - Narrow Range
OC2RC_PT019P	1154GP9	RC Loop B Pressure - Narrow Range
OC2RC_PT020P	1154GP9	RC Loop B Pressure - Narrow Range
OC2RC_PT021P	1153GD9	RC Loop A Pressure - Wide Range
OC2RC_PT022P	1153GD9	RC Loop B Pressure - Wide Range
OC2RC_PT0224	1154GP9	Pressurizer Pressure
OC2RC_PT0225	1154GP9	RC Loop A Pressure
OC2RC_PT0226	1154GP9	RC Loop B Pressure
OC2RC_PT023P	1153GD9	RC Loop A Pressure - Wide Range
OC3C__LT0036	1153DB5	Upper Surge Tank Level Train A
OC3C__LT015A	1153DB5	Upper Surge Tank Level Train B
OC3FDWLT066	1154DP5	SSF S/G #A Level
OC3FDWLT067	1154DP5	SSF S/G #B Level
OC3FDWLT0080	1154DP5	S/G #A Level Train A
OC3FDWLT0081	1154DP5	S/G #B Level Train A
OC3FDWLT0082	1154DP5	S/G #A Level Train B
OC3FDWLT0083	1154DP5	S/G #B Level Train B
OC3HPIFT0157	1154HP4	SSF RC Makeup Pump Flow
OC3HPIFT0159	1153HB6	HPI Pump Flow
OC3HPIFT0160	1153HB6	HPI Pump Crossover Flow
OC3HPIPT0223	1154GP6	SSF RC Makeup Pump Suction Pressure
OC3HPIPT0227	1154GP9	RC Makeup Pump Discharge Pressure
OC3LPILT002A	1153DB5	Borated Water Storage Tank Level
OC3LPILT0006	1153DB5	Borated Water Storage Tank Level
OC3LPILT0132	1153DB5	Borated Water Storage Tank Level
OC3RC_FT014B	1154HP6	RC Flow Loop A
OC3RC_FT014C	1154HP6	RC Flow Loop A
OC3RC_FT014D	1154HP6	RC Flow Loop A
OC3RC_FT014E	1154HP6	RC Flow Loop A
OC3RC_FT015B	1154HP6	RC Flow Loop B
OC3RC_FT015C	1154HP6	RC Flow Loop B
OC3RC_FT015D	1154HP6	RC Flow Loop B
OC3RC_FT015E	1154HP6	RC Flow Loop B
OC3RC_LT0072	1154HP5	SSF Pressurizer Level

Table 3 (cont'd)

OC3RC_PT017P	1154GP9	RC Loop A Pressure - Narrow Range
OC3RC_PT018P	1154GP9	RC Loop A Pressure - Narrow Range
OC3RC_PT019P	1154GP9	RC Loop B Pressure - Narrow Range
OC3RC_PT020P	1154GP9	RC Loop B Pressure - Narrow Range
OC3RC_PT021P	1153GD9	RC Loop A Pressure - Wide Range
OC3RC_PT022P	1153GD9	RC Loop B Pressure - Wide Range
OC3RC_PT023P	1153GD9	RC Loop A Pressure - Wide Range
OC3RC_PT0224	1154GP9	Pressurizer Pressure
OC3RC_PT0225	1154GP9	RC Loop A Pressure
OC3RC_PT0226	1154GP9	RC Loop B Pressure

Action Item 2

"Determine whether any transmitters identified in Item 1 are from the manufacturing lots that have been identified by Rosemount as having a high failure fraction due to loss of fill-oil. Addressees are requested not to utilize transmitters from these suspect lots in the reactor protection or engineered safety features actuation systems; therefore, addressees are requested to develop and implement a program to replace, at the earliest appropriate opportunity, transmitters from these suspect lots in use in the reactor protection or engineered safety features actuation systems."

Duke's Response:

A summary of the disposition of suspect lot transmitters at Catawba and McGuire Nuclear Stations, respectively, is provided in the following tables (Tables 4 and 5). There have been no suspect lot transmitters supplied to Oconee Nuclear Station. There are no transmitters from these suspect lots installed in Reactor Protection System or Engineered Safety Features Actuation System applications at any Duke Power nuclear station. The following is a summary of the disposition of the suspect lot transmitters:

Catawba Nuclear Station

a) There are only two suspect lot transmitters installed in Safety-Related applications at Catawba Nuclear Station. These are CN2KCFT5540 and CN2 KCFT5541. Although no such action is required by the Bulletin, both instruments will be refurbished with new (post July 11, 1989) sensor modules, or will be replaced with non-suspect lot transmitters, at the earliest opportunity. There is currently a long wait for sensor modules or transmitters ordered from Rosemount.

b) There are only three suspect lot transmitters available as spares for Safety-Related applications at Catawba. These transmitters will not be used until they are refurbished with new sensor modules at the earliest opportunity.

c) The remaining suspect lot transmitters at Catawba are either installed in Non-Safety applications or are available for use as a Non-Safety spare. Please note that one transmitter is missing and is presumed to have been scrapped. It cannot be located in any Safety-Related application, and it is not in the QA warehouse as a spare. Additionally, it is not installed where original documentation shows that it was installed(CN2CFLT5612, S/G-A Wide Range Level). It apparently failed and was replaced.

McGuire Nuclear Station

d) There is only one suspect lot transmitter installed in a Safety-Related application at McGuire Nuclear Station. This transmitter is used for

Unit 1 Containment Spray Pump A Discharge Flow (MC1NSFT5020). This instrument has been tested and has shown no signs of oil loss.

e) The remaining suspect lot transmitters at McGuire are installed in Non-Safety applications. Please note that one transmitter is presumed to have been scrapped. It is not installed in any safety-related application, and it is not in the QA warehouse as a spare.

Oconee Nuclear Station

f) There have been no suspect lot transmitters supplied to Oconee Nuclear Station, as previously stated.

DUKE POWER COMPANY
RESPONSE TO NRC BULLETIN 90-01
LOSS OF FILL-OIL IN TRANSMITTERS MANUFACTURED BY ROSEMOUNT

TABLE 4

DISPOSITION OF SUSPECT LOT TRANSMITTERS
DUKE POWER COMPANY
CATAWBA NUCLEAR STATION

Model #	Serial #	Tag #	Application or Remarks
1153DB5	411270	CN2CFLT5622	S/G-B WR Level (Non-Safety)
1153HB5	411553	CN2NCLT5151	SSF Pressurizer Level (Non-Safety)
1153DB5	411271	CN2CFLT5632	S/G-C WR Level (Non-Safety)
1153GB9	411654	CN2NCPT5121	NC Loop 2 HL WR Pressure (Non-Safety)
1153DB4	414870	CN2KCFT5541	KC Header B Inlet Flow (Safety-Related)
1153DB4	414871	N/A	Replaced (Did not suffer oil loss)
1153DB4	414868	N/A	Spare (to be refurbished)
1153DB4	414869	N/A	Spare (to be refurbished)
1153DB4	414873	N/A	Spare (to be refurbished)
1153HB5	409741	N/A	Supplied from vendor as Non-Safety
1153HB5	410120	N/A	Supplied from vendor as Non-Safety
1153DB5	411269	N/A	Not installed, not in stock, presumed scrapped
1153HB5	411237	N/A	In Non-QA warehouse for Non-Safety use
1153DB4	414872	CN2KCFT5540	KC Header B Inlet Flow (Safety-Related)
1153DB5	411272	CN2CFLT5642	S/G-D WR Level (Non-Safety)

TABLE 5

DISPOSITION OF SUSPECT LOT TRANSMITTERS
DUKE POWER COMPANY
McGUIRE NUCLEAR STATION

Model #	Serial #	Tag #	Application or Remarks
1153DD5	414647	MC1NSFT5020	NS Pump A Discharge Flow (Safety-Related)
1153DD5	411135	MC2NCLT5990	NC System WR Level (Non-Safety)
1153DD5	411136	MC2SMFT5050	SM Flow from S/G-C Ch. 2 (Non-Safety)
1153DB5	298577	N/A	Not installed, not in stock, presumed scrapped

Action Item 3

"Review plant records (for example, the three most recent calibration records) associated with the transmitters identified in Item 1 above to determine whether any of these transmitters may have already exhibited symptoms indicative of loss of fill-oil. Appropriate operability acceptance criteria should be developed and applied to transmitters identified as having exhibited symptoms indicative of loss of fill-oil from this plant record review. Transmitters identified as having exhibited symptoms indicative of loss of fill-oil that do not conform to the operability acceptance criteria should be addressed in accordance with the applicable technical specification. Transmitters identified as having exhibited symptoms indicative of loss of fill-oil that do not conform to the operability acceptance criteria and are not addressed in the technical specifications should be replaced at the earliest appropriate opportunity."

Duke's Response:

Plant records associated with the transmitters identified in Item 1 were reviewed to determine whether any of these transmitters may have exhibited excessive drift, which may be a symptom indicative of loss of fill-oil. The calibration records for each safety-related Rosemount Model 1153 Series B, 1153 Series D, and Model 1154 transmitter were reviewed over the last three calibration cycles, with a few exceptions as explained below. There were some transmitters which have not yet been installed through three complete calibration cycles. All available field calibration records were checked for these applications. All calibration data sheets which were available from the last four calibrations of each transmitter were used to perform the review of the last three calibration cycles.

The calibration data sheets were used to determine which transmitters exhibited excessive drift, which may potentially indicate a loss of oil. The criteria listed below (Table 6) were used as the basis for making the aforementioned determination.

TABLE 6

CRITERIA FOR ADDITIONAL TESTING ON ROSEMOUNT
MODEL 1153 AND 1154 PRESSURE TRANSMITTERS

Range Code	Range	Testing Criteria
3	0-5/30"WC	Zero Shift ≥ - 4% URL x Turn-Down or ≥ + 3% URL x Turn-Down
4	0-2 5/150"WC	Zero Shift ≥ - 0.5% URL x Turn-Down or ≥ + 1.5% URL x Turn-Down
5	0-125/750"WC	Zero Shift ≥ - 0.8% URL x Turn-Down or ≥ + 1.45% URL x Turn-Down **Span Shift** ≥ + 0.95% Calibrated Range
6	0-17/100 PSI	Zero Shift ≥ - 2.8% URL x Turn-Down or ≥ + 3.4% URL x Turn-Down **Span Shift** ≥ + 0.60% Calibrated Range
7	0-50/300 PSI	Zero Shift ≥ - 0.9% URL x Turn-Down or ≥ +1.0% URL x Turn-Down
8		No Detectable Drift (no existing criteria)
9		No Detectable Drift (no existing criteria)

NOTE: WC = Inches Water Column
URL = Upper Range Limit
PSI = Pounds/Square Inch

There is no readily detectable drift associated with Range Code 8 and 9 transmitters as they fail due to a loss of oil. However, records for these instruments were reviewed to insure no signs of gross failure.

The cumulative zero shifts observed through the three calibration cycles were compared to the maximum zero shifts as listed in the above table. These criteria were developed from Rosemount Technical Bulletin Four. Transmitters with cumulative shifts exceeding those specified in the testing criteria were considered potentially defective (due to excessive shift).

No potentially defective transmitters were discovered at McGuire or Oconee Nuclear Stations through this process. However, three transmitters were found to have exhibited excessive drift (which may be an indication of loss of fill-oil) during the review of Catawba transmitters. These are:

CN1KCFT5541	Component Cooling Header B Inlet Flow - Auxiliary Shutdown Panel (ASP) Indication
CN1NVLT6070	Boric Acid Tank Level, Channel #4
CN2NVLT5740	Boric Acid Tank Level, Channel #1

Work requests were written to investigate these transmitters and determine whether they are operable. All three transmitters have been tested to determine possible oil loss and have passed the operability acceptance criteria, as defined in our response to Action Item 4.b of this bulletin. Therefore, these transmitters have been returned to service, and have been determined to not be suffering from a loss of fill-oil.

There have been only two confirmed oil loss failures and one unconfirmed oil loss failure of Rosemount Model 1153 Series B, Model 1153 Series D, or Model 1154 transmitters. These are as follows:

Catawba Unit 2 (Confirmed)

- Model # 1153HD5, Serial # 408499 (Rosemount) failed 4/89
  Tag # CN2NCFT5050
  Reactor Coolant Flow, Loop 2, Channel 3
  Time sensing pressure: approximately 30 months
  Corrective Actions Taken: Transmitter was replaced by a transmitter manufactured by another vendor. No other Rosemount transmitters are installed in this application at Catawba.

McGuire Unit 1 (Confirmed)

- Model # 1153DD5, Serial #405828 (Rosemount) failed 12/88
  Tag # MC1CAFT5111
  Auxiliary Feedwater Flow to Steam Generator #C
  Time Sensing Pressure: approximately 40 months
  Corrective Actions Taken: Transmitter was replaced with a like kind.

Oconee Unit 2 (Not Confirmed)

There have been no confirmed cases of fill-oil loss in Rosemount transmitters at Oconee Nuclear Station. However, a review of NPRDS failure records for Safety-Related Rosemount transmitters at Duke Power revealed one instrument (located in Oconee Unit 2) which potentially may have failed due to a loss of sensor oil. The failure description did not indicate any sluggishness, but it did indicate a deviation of more than 75 PSI from a redundant channel. It also indicated that the instrument could not be calibrated, and would not give consistent readings.

This transmitter has been destroyed, and the true cause of failure can not be determined or confirmed. Information concerning this transmitter is listed below:

- Model # 1153GD9 (Rosemount) failed 8/23/88
  Tag # 0C2RCPT023P
  Reactor Coolant Loop A Wide Range Pressure
  Time Sensing Pressure: approximately 20 months
  Corrective Actions Taken: Transmitter was replaced with a like kind.

Action Item 4

"Develop and implement an enhanced surveillance program to monitor transmitters identified in Item 1 for symptoms of loss of fill-oil. This enhanced surveillance program should consider the following or equally effective actions:

Action Item 4.a

Ensuring appropriate licensee personnel are aware of the symptoms that a transmitter, both during operation and during calibration activities, may exhibit if it is experiencing a loss of fill-oil and the need for prompt identification of transmitters that may exhibit these symptoms."

Duke's Response:

A training package was issued to the Operations, Instrument and Electrical, and Maintenance Engineering Services groups at each station to describe the oil loss phenomena (and the symptoms that may be exhibited by transmitters which have lost sensor fill oil). Additionally, this document instructs Maintenance and Operations personnel to notify the appropriate engineering personnel immediately if any symptoms are observed. The training will be completed by December 31, 1990. This completion date allows the training to be placed into current training schedules.

Action Item 4.b

"Enhanced transmitter monitoring to identify sustained transmitter drift."

Duke's Response:

The enhanced monitoring program at Duke Power Company (Catawba, McGuire, and Oconee Nuclear Stations) consists of Long-term Calibration Zero Shift Trending and an Enhanced Surveillance program. This enhanced monitoring program will continue until sufficient data is obtained to demonstrate that there is no longer a need for the program. Duke Power is working with the Nuclear Management and Resources Council (NUMARC) in an effort to achieve this goal.

Long Term Calibration Zero Shift Trending

Nuclear Maintenance will implement a computer-based trending program for Rosemount Model 1153 Series B, Model 1153 Series D, and Model 1154 transmitters used in Safety-Related applications at Catawba, McGuire, and Oconee Nuclear Stations. This program will be in place by October 31, 1990. The data from the last four calibrations of each instrument, which was gathered for the response to Action Item 3, will be included in this database as baseline data.

The trending program, when it takes place by October 31, 1990, will operate as follows:

The zero shift will be trended from calibration to calibration for Rosemount transmitters as specified above. Additionally, the span shift will be trended for Range Code 5 and Range Code 6 instruments, which potentially exhibit a more pronounced span shift than do instruments of other capsule spans. Data obtained during each refueling calibration (beginning with the next scheduled refueling outage for each unit) will be forwarded to Nuclear Maintenance by the stations, and will then be placed into the database. These outages are currently scheduled

to begin on 8/23/91 (Oconee Unit 1), 9/06/90 (Oconee Unit 2), 2/27/91 (Oconee Unit 3), 8/25/91 (McGuire Unit 1), 9/01/90 (McGuire Unit 2), 4/02/91 (Catawba Unit 1), and 9/25/91 (Catawba Unit 2). Nuclear Maintenance is responsible for analyzing the data obtained during each outage to look for excessive drift (i.e., zero shift or span shift) between calibration intervals. The "Criteria for Additional Testing on Rosemount Model 1153 and 1154 Pressure Transmitters," previously given in Table 6, is the basis for determining excessive drift. Transmitters identified by Nuclear Maintenance as having drifted excessively must be tested per the full-range calibration and response time test described in the following section entitled "Enhanced Surveillance." This test serves as the Operability Acceptance Criteria.

Enhanced Surveillance Program

An enhanced surveillance program has been developed to look for possible oil loss in Rosemount Model 1153 Series B, Model 1153 Series D, and Model 1154 transmitters manufactured prior to July 11, 1989. The program will be implemented by the start of the next Refueling Outage for each unit. During each instrument calibration, technicians watch for any signs of sluggishness from Rosemount transmitters. "As-Found" calibration data and "As-Left" calibration data from the previous calibration cycle are compared for evidence of an excessive zero shift (and also for excessive span shift for Range Codes 5 and 6). The acceptance criteria used in determining excessive zero shift, as described in Table 6 under Action Item 3, was derived from Rosemount Technical Bulletin Four.

An extensive full-range calibration and response time check is performed on each transmitter that exceeds the aforementioned drift criteria (Range Code 3-7 instruments) . Range Code 8 and 9 instruments receive this special test at every calibration interval, since very little drift occurs before response time degradation begins for those particular instruments. This test serves as the Operability Acceptance Criteria for transmitters suspected of oil loss.

Although not required by NRC Bulletin 90-01, Model 1153 Series B, Model 1153 Series D, and Model 1154 Rosemount transmitters manufactured after July 11, 1989, will be included in the long term calibration zero shift database established by Duke Power Company. However, these instruments are not included in the enhanced surveillance program, since the 10CFR-Part 21 notification does not apply to post-July 11, 1989 transmitters due to tightened manufacturing tolerances and improved sensor module testing by Rosemount. Regardless of the exclusion of these instruments from the enhanced surveillance program itself, however, Nuclear Maintenance will monitor Safety-Related post-July 11, 1989 transmitters as part of the Long-Term Calibration Zero Shift Trending program. If excessive transmitter drift is observed, Nuclear Maintenance will notify the appropriate station to test that transmitter. Additionally, technicians will watch for signs of sluggishness in these instruments during routine calibrations.

The Enhanced Surveillance Program consists of:

Full Range Calibration and Response Time Check

The full-range calibration and response time check are performed on each side of the sensor cell for differential pressure transmitters which require additional testing. The tests are performed on the high pressure side of the cell only for gage and absolute pressure applications (since the low pressure side is not pressurized and a failure under no pressure is not likely). Any transmitter that fails these tests is considered potentially defective, and station engineering personnel will be alerted by procedure to make a final determination.

Full Range Calibration and Response Time Check Description

Basically, the test is performed as follows:

1) A pressure source is connected to the high pressure side of the cell. The low pressure side is vented.
2) The instrument is calibrated for a 4mA to 20mA output over the full capsule span of the instrument.
3) The instrument response to a step input change of 150% Upper Range Limit is checked. The transmitter response is judged against the standards in Table 7:

TABLE 7

REQUIRED TRANSMITTER RESPONSE TIMES

Range Code	Time Required to Reach 20mA Output
3	10.0 sec.
4	2.5 sec.
5	1.0 sec.
6	1.0 sec.
7	1.0 sec.
8	1.0 sec.
9	1.0 sec.
0	1.0 sec.

4) The pressure source is connected to the low pressure side of the transmitter, and the high pressure side is vented (differential pressure models only).
5) The transmitter is recalibrated for a 20mA to 4mA output over the full capsule span of the instrument (differential pressure models only).
6) The response time check is repeated for the low pressure side of the instrument (differential pressure models only).
7) The transmitter may be recalibrated to its normal range and may be returned to service if it passes this test.

The transmitters are calibrated to their full capsule span prior to testing because a loss of sensor oil will always become apparent at full span before it becomes apparent at a turned-down span. Since most transmitters are operated at some degree of turndown, testing the transmitters at full capsule span is more conservative than testing at the normal calibrated span. Failing transmitters can be detected with some amount of advance warning by testing in this manner during instrument calibration (i.e., if a transmitter has not yet failed at full capsule span, it cannot be failed at reduced span for some (albeit undefined) length of time. The longer a transmitter has operated successfully, obviously, the slower the transmitter sensor module must be leaking oil (if it is indeed leaking oil). Therefore, the longer a transmitter has operated successfully, the greater the advance warning of impending failure that this methodology will provide.

The transmitters are checked for proper response to a step input of a magnitude of 150% of full capsule span. This is done (in lieu of testing to 100% of capsule span) because the greater input pressure should make the distinction between leaking transmitters and normal transmitters more obvious. This test depends on noting the acceptable response time of the instrument (not on the ability of a transmitter to reach 27 or 28 mA, as did previously discounted overpressure tests). Normal transmitters are capable of responding properly to input pressures of 150%.

Action Item 4.c

"Review of transmitter performance following planned or unplanned plant transients or tests to identify sluggish transmitter response."

Duke's Response:

A review of transmitter performance following planned or unplanned plant transients or tests will not be as likely to detect defective transmitters as the program already described in item "b" above. Therefore, these actions are not being included in the transmitter monitoring program at this time. However, as described in the response to Action Item 4.b above, a review of transmitter performance during calibration tests will be performed in accordance with the described program.

Furthermore, it is not feasible to review the performance of all transmitters following every planned or unplanned transient. Not all transmitters are monitored by the transient recorder. Monitoring by the Operator Aid Computer (OAC) is not sufficient for this purpose due to the lack of an ability to reproduce the transient response of an instrument from the OAC. It is also not feasible to install Visicorders or other equivalent chart recorders for each application not covered by the Transient Monitor. Additionally, transmitters which have lost fill-oil may respond normally to increasing transients but not decreasing transients, or vice-versa. Such a review may not always identify failed transmitters even though it would require many man-hours to perform each time.

Action Item 4.d

"Enhanced awareness of sluggish transmitter response to either increasing or decreasing test pressures during calibration activities".

Duke's Response:

The implementation of this item has been described under the response to Action Items 4.a and 4.b. Instrument and Electrical (IAE) technicians have been given an enhanced awareness of the possibility for oil loss in Rosemount transmitters and the need to watch for sluggish transmitter responses during transmitter calibration. Additional training will be completed by December 31, 1990, as described under the response to Item 4.a.

Action Item 4.e

"Development and implementation of a program to detect changes in process noise."

Duke's Response:

Duke Power has reviewed the use of Noise Analysis methodology for detection of oil loss. The noise analysis technique is useful as a "rough cut" indicator of possible oil loss only if two conditions are met:

i) The transmitter being analyzed operates near the trip setpoint.
ii) The process is sufficiently noisy.

Any application which does not meet both of these conditions is not a suitable candidate for the noise analysis technique.

One method of noise analysis is to record the transmitter output and compare process noise passed on to the output from the sensor with data previously stored for that transmitter. Alternately, the signal may be compared with that of redundant channels. Transmitters having lost oil may exhibit a lower sensitivity to process noise than they did at some time before a significant oil loss occurred, or may exhibit a lower sensitivity than normal transmitters in redundant channels. Alternately, the output signal for a transmitter may be recorded, and the signal may be mathematically analyzed for descriptors such as variance, skewness, flatness, fifth moment, 2nd power ratio, 3rd power ratio, and fifth power ratio. This mathematical technique was developed by an independent testing firm, Analysis and Measurement Services Corporation (AMS).

However, the noise analysis technique, per AMS, "may not always provide incipient failure detection." It will not work in all applications, as previously noted. The methodology is not an exact science. For example, the results of the noise analysis test for each descriptor (variance, skewness, etc.) must be compared and ultimately an educated guess must be made as to whether the transmitter has failed. The results of each test, by descriptor, will not always agree with tests based on other descriptors. Good transmitters may be labeled "bad" and vice-versa. Furthermore, Duke Power believes that long-term trending and special calibration checks are the best way to look for failing transmitters. The additional drain on manpower due to implementation of a noise analysis program would be substantial, and the benefits gained are not deemed significant enough to justify the program.

Action Item 4.f

"Development and application to transmitters identified as having exhibited symptoms indicative of loss of fill-oil of an appropriate operability acceptance criteria. Transmitters identified as having exhibited symptoms indicative of loss of fill-oil that do not conform to the operability acceptance criteria should be addressed in accordance with the applicable technical specification. Transmitters identified as having exhibited symptoms indicative of loss of fill-oil that do not conform to the operability acceptance criteria and are not addressed in the technical specifications should be replaced at the earliest appropriate opportunity."

Duke Response:

Please see the response to Action Item 3, in regards to the development and application of an operability acceptance criteria for the three transmitters which had exhibited some signs of oil loss per our enhanced guidelines (acceptance criteria). Work requests were written to test these three transmitters. All three of these transmitters have been tested per established operability acceptance criteria and are fully operational.

Any transmitters which fail to conform to the operability acceptance criteria for transmitters suspected of loss of fill-oil at some future time will be handled in accordance with the applicable Technical Specifications, as required by the bulletin. Those transmitters which fail to conform to the operability acceptance criteria, do exhibit symptoms indicative of loss of fill-oil, and are not addressed by Technical Specifications, will be replaced or repaired (through installation of a new sensor Module) as soon as possible.

Action Item 5

"Document and maintain in accordance with existing plant procedures a basis for continued plant operation covering the time period from the present until such time that the Model 1153 Series B, 1153 Series D, and Model 1154 transmitters from the manufacturing lots that have been identified by Rosemount as having a high failure fraction due to loss of fill-oil in use in the reactor protection or engineered safety features actuation systems can be replaced. In addition, while performing the actions requested above, addressees may identify transmitters exhibiting symptoms indicative of loss of fill-oil that do not conform to the established operability acceptance criteria and are not addressed in the technical specifications. As these transmitters are identified, this basis for continued plant operation should be updated to address these transmitters covering the time period from the time these transmitters are identified until such time that these transmitters can be replaced. When developing and updating this basis for continued plant operation, addressees may wish to consider transmitter diversity and redundancy, diverse trip functions (a separate trip function that may also provide a corresponding trip signal), special system and/or component tests, or (if necessary) immediate replacement of certain suspect transmitters."

Duke's Response:

There are no transmitters from the suspect lots used in Reactor Protection System or Engineered Safety Features Actuation Systems applications at any of the Duke Power nuclear stations, as previously noted. Therefore, no Justification for Continued Operation (JCO) was needed for any transmitters in these applications.

Please see the responses for Action Items 3 and 4.f, pertaining to the Work Requests which were issued on three transmitters at Catawba. It was discovered during our review of the calibration data from the last three calibration cycles that these transmitters had drifted excessively. All three of the transmitters have since been tested per the operability acceptance criteria of Action Item 3 and are considered operable. No other transmitters have exhibited symptoms indicative of loss of fill-oil since April, 1989, which is the last time a Rosemount Model 1153 or 1154 transmitter failed at Duke Power due to fill-oil loss (refer to the response to Action Item 3 for details on the two confirmed and one unconfirmed fill-oil loss failures experienced to date at Duke Power). Therefore, no JCO's are required for any Rosemount transmitters at the present time. If any JCO's are required due to future transmitter failures, they will be prepared in accordance with existing JCO guidelines. Any Rosemount Model 1153 Series B, Model 1153 Series D, or Model 1154 transmitters which fail with symptoms of loss of fill-oil, or are confirmed to have lost fill-oil, will be reviewed for reportability per NRC regulations. Documentation consistent with Item 1 b) of the reporting requirements will be maintained on any such transmitters whether their failure is reportable or not.

Additionally, transmitter failures which are within the scope of Nuclear Plant Reliability Data System (NPRDS) reporting guidelines (i.e., those failures which occur in applications included in the NPRDS database) will be reported to NPRDS.

DUKE POWER COMPANY
RESPONSE TO NRC BULLETIN 90-01
LOSS OF FILL-OIL IN TRANSMITTERS MANUFACTURED BY ROSEMOUNT

Summary of Action Items

1) Action Item 1 - Completed.

2) Action Item 2, Commitment 1 - Transmitters CN2KCFT5540 and CN2KCFT5541 at Catawba will be refurbished or replaced at the earliest opportunity, although not specifically required by the bulletin. No specific schedule is provided because of the current long lead times associated with obtaining spare parts or replacement transmitters from Rosemount.

3) Action Item 2, Commitment 2 - The three spare transmitters from the suspect lots which were found in the QA warehouse at Catawba are being returned to Rosemount for refurbishment with new cells.

4) Action Item 3 - Completed.

5) Action Item 4.a - The necessary training to ensure that the appropriate personnel are aware of the symptoms that a transmitter may exhibit if it is experiencing a loss of fill-oil will be completed for all three stations by no later than December 31, 1990.

6) Action Item 4.b, Commitment 1 - A Long-term Calibration Zero Shift Trending program will be implemented by October 31, 1990, as described in the response to NRC Bulletin 90-01. This program will continue until sufficient data has been collected to justify discontinuation of the program.

7) Action Item 4.b, Commitment 2 - The Enhanced Surveillance Program will be implemented at each station by the start of the next scheduled Refueling Outage at each unit, as described in the response to NRC Bulletin 90-01. This program will continue until sufficient data has been collected to justify discontinuation of the program.

8) Action Item 4.d - The Instrument and Electrical technicians have been given an enhanced awareness of the oil loss phenomena. Training on this subject will be completed by no later than December 31, 1990.

9) Action Item 4.f - Completed.

10) Action Item 5 - Completed.