Date: November 18, 2003

To: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

From: Christine Castleberry
Regulatory and Quality Assurance Manager
Cardinal Health
Radiation Management Services
6045 Cochran Road
Solon, OH 44139

Re: 10CFR Part 21 Notification
(Initial Report)

In accordance with 10CFR21, please find the attached notification.

Should you have any questions or require further information, please contact me at (516) 870-0100 or via email at christine.castleberry@cardinal.com or Zisimos Giatis at (440) 498-2550 or via email at zisimos.giatis@cardinal.com.

Respectfully,

Christine Castleberry

IE19

1.0 Name and address of individual informing the Commission:

Christine Castleberry
Regulatory and Quality Assurance Manager
Cardinal Health Radiation Management Services
6045 Cochran Rd.
Solon, OH. 44139

(Formerly Victoreen and Inovision)

2.0 Identification of the basic component supplied which fails to comply or contains a defect:

The potential exists for incorrect solder to have been used on the internal High Voltage and Signal solder connections in Model 877-1 High Range Containment monitor detectors manufactured between 6/1/00 and 11/1/03. While the incorrect solder will maintain its integrity at the maximum operating temperature of the unit, the temperature margin designed into the unit will not be realized.

Detectors manufactured prior to 6/1/00 are not affected.

Field Termination kits, P/N 877-1-15 and 877-1-15-1 are not affected by this notification.

3.0 Identification of the firm supplying the basic component which fails to comply or contains a defect:

Cardinal Health Radiation Management Services
6045 Cochran Rd.
Solon, OH. 44139

(Formerly Victoreen and Inovision)

4.0 Nature of the defect or failure to comply and the Safety Hazard created:

Background: The Model 877-1 is a High Range Containment radiation monitor detector. The detector is an all welded, stainless steel, hermetically sealed, Ion Chamber that operates at atmospheric pressure.

General Description: In 1981, the Model 877-1 High Range Containment detector was qualified for operation during and after a Loss of Coolant Accident (LOCA). The qualification program is documented in Victoreen Qualification Type Test Data Report 950.301. The LOCA temperature profile used in the

qualification test was based on the Combined PWR/BWR LOCA profile defined in IEEE-323, Appendix A. To include margin in the LOCA test, the maximum temperature stated in Appendix A of IEEE-323 was increased by 5%, from 340 ^{0}F to 357 ^{0}F. The internal detector high voltage and signal connections, for the unit tested, were soldered with a lead free, 96.5% Sn and 3.5% Ag silver solder. This type of solder has an established melting temperature of 430 ^{0}F, providing a 73 ^{0}F margin in the solder joint design.

Nature of Failure to Comply: In the units subject to this notification, the internal detector high voltage and signal connections may have been soldered with a 60% Sn and 40% Pb solder. This type of solder has an established melting temperature range of 361 ^{0}F to 374 ^{0}F. While this is still above the 357 ^{0}F maximum test temperature, the same temperature margin designed into the unit will not be realized with the 60% Sn and 40% Pb solder.

From a worst case analysis, if the LOCA temperature increased 4 to 17 ^{0}F above the 357 ^{0}F qualification maximum temperature and the 361 - 374 ^{0}F melting range, it would be possible for both the signal and high voltage solder connections to melt, potentially resulting in an open and/or short circuit. The melted solder would flow, by capillary action, along the buss wire and the solder post or ground lug connection. Due to the capillary action of the solder, it is doubtful that the electrical connections would break, resulting in an open circuit. In the event of an open circuit, however, the Electronic Check Source (ECS) test, that automatically runs every 17.1 minutes, would actuate and indicate a channel failure.

During a LOCA, the steam pressure released would result in vibrations in the detector, the magnitude of which would vary, based on actual location of the detector relative to the leak. This vibration, coupled with a temperature above the melting range, could result in solder "spatters" inside of the chamber. These "spatters" could result in a short circuit in the connector cavity in the base plate of the detector. If the solder shorted the signal to ground, the radiation value would decrease. Within 17.1 minutes, the Electronic Check Source (ECS) test would actuate and indicate a channel failure. If the solder shorted the High Voltage to ground, the High Voltage will begin to drop from its normal 500Vdc value. When the High Voltage drops to approximately 400 Vdc, the FAIL/SAFE circuit will turn off, and the channel fail relay will change state. In either event, a channel failure would be indicated.

In the original design, melting of the internal solder connections would not occur until the ion chamber internal temperature increased to 430 ^{0}F.

SAFETY IMPACT: The overall impact of the use of the incorrect solder is that the temperature margin designed into the unit, and demonstrated in the qualification test program, will not be achieved if the lower temperature solder was used. Note the temperature at which the 60/40 solder enters the paste range, 361 ^{0}F, is still above the maximum test temperature, 357 ^{0}F.

For a PWR, the maximum temperature specified in Appendix A of IEEE-323, Appendix A, is 300 ^{0}F. This is well below the 361 ^{0}F paste range of the 60/40

solder. Based on the above, the unit should continue to operate when subjected to the PWR LOCA event.

For a BWR, the maximum temperature specified in Appendix A of IEEE-323, Appendix A, is 340 ^{0}F. This is still below the 361 F paste range of the 60/40 solder, and, based on the above, the unit should continue to operate when subjected to the BWR LOCA event.

Because the temperature margin designed into the unit will be reduced if the 60/40 solder was used, it was decided to provide this notification to all affected Users. A Risk Analysis summary is provided in Attachment 2.

5.0 The date on which the information of such defect or failure to comply was obtained:

The problem was discovered while reviewing a routine Engineering Change Notice for the Part Number 877-1-80 Detector sub-Assembly. During the review, it was learned the Vendor part number for the original lead free silver solder used in the qualification was no longer available, and that a 60/40 Tin/Lead solder was used for the eight (8) internal signal, high voltage and ground connections in a unit presently being manufactured.

A preliminary meeting between Quality Assurance, Systems Engineering, and Manufacturing was held November 11, 2003 to review the solder issue. After further analysis, a follow-up meeting was held November 17, 2003. As a result of this meeting it was determined that a 10CFR21 notification was required.

6.0 Affected facilities:

The following NRC licensed users are affected by this failure to comply:

Owner/Plant:

Entergy Nuclear / Vermont Yankee (1)
S Carolina Electric & Gas / VC Summer (3)
Georgia Power Co. / Hatch (2)

Other affected customers are located in Korea (2) and in Belgium (1).

A complete list of affected users, and detector serial numbers, is provided as an attachment.

7.0 Corrective Action:

1. As a result of the initial meeting, an immediate Hold was placed on Model 877-1 detectors being manufactured, and shipment of any new 877-1 detectors.

2. ECN 3977 has been initiated to define a replacement for the MSA-0015 silver solder. The replacement will be required to provide the same 96.5% Sn, 3.5% Ag composition.

3. A review of our complete product line was performed. The review confirmed that only the products listed here-in were affected by the solder substitution.

4. Notification letters will be sent to the affected utilities, advising them of the potential for reduced temperature margin in the event of a LOCA event. The letters will be mailed by November 28, 2003.

8.0 Advice related to the defect or failure to comply about the basic component that has been, is being, or will be given to purchasers:

As stated in the analysis above, we believe there is no need to replace or repair the detectors subject to this failure to comply notification.

For further information please contact:

Zisimos Giatis
Quality Control Manager
Cardinal Health Radiation Management Services
Ph: 440-498-2550
Email: zisimos.giatis@cardinal.com

Attachment 1 – List of 877-1 Users with Potentially Incorrect Solder Connections

Customer:	Plant:	Purchase Order:	Sales Order No.:	Ship Date:	Serial No.:
Entergy Nuclear Vermont Yankee	Vermont Yankee	VY014544	185667	10/31/02	102463
Georgia Power	Hatch	6052356	175573	10/31/02	102465
Georgia Power	Hatch	6052356	175573	10/31/02	102466
South Carolina Electric & Gas	V. C. Summer	SR715810	181000	10/31/02	102464
South Carolina Electric & Gas	V. C. Summer	SR715810	181000	7/31/02	102462
South Carolina Electric & Gas	V. C. Summer	SR709121	155438	2/28/02	102461
Non- US Installations:					
Centrale Nucleaire De Tihange	Tihange 3	4500196326	172821	1/6/03	102467
Korea Electric Power Co.	KORI 3/4 or Yeonggwang 1/2	C00NYG2C0 58480	162871	11/30/01	102459
Korea Electric Power Co	KORI 3/4 or Yeonggwang 1/2	C99NKRB02 26230	157151	11/30/01	102460

ATTACHMENT 2 - RISK ANALYSIS

Risk Analysis Table

SYSTEM RISK ANALYSIS TABLE **Cardinal Health Radiation Management Services**

Model 877-1; Reduced Temperature (357 ^{0}F) Margin on Internal Solder Connections; Design based on use of 96.5%, SN and 3.5% Ag solder, with a melting temperature of 430 ^{0}F

Hazard	Cause	Effect	Severity	Probability	Detectability	Risk Index
Reduced safety margin as LOCA temp increases to 357^{0}F max qualified temperature:	60/40 Sn/Pb Solder used instead of 96.5/3.5 Sn/Ag	None; 60/40 Solder melting range, 361–374 ^{0}F, is above LOCA temperature	a	A	1	1
Reduced safety margin as LOCA temp increases Above 357 ^{0}F Qualification temperature:	60/40 Sn/Pb Solder used instead of 96.5/3.5 Sn/Ag	Melted solder Shorts or Opens H V Connection; Channel Fails in 17.1 mins	b	B	1	1
Reduced safety margin as LOCA temp increases Above 357 ^{0}F Qualification temperature:	60/40 Sn/Pb Solder used instead of 96.5/3.5 Sn/Ag	Melted solder Shorts or Opens Signal Connection; Channel Fails in 17.1 mins	b	B	1	1
Engineering Operating Procedure Number: EOP-04-12					**Revision: A**	

Risk Index 1 = Acceptable / Acceptable as Implemented

Method of Management: **For temperatures below 357 ^{0}F, No Action required. For temperatures above 357 ^{0}F, the Qualification Limit of the detector, the detector may fail, and alternate means of measurement may be required.**