

December 16, 2005

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Mail Stop P1-137  
Washington, DC 20555-0001

ULNRC05243



Ladies and Gentlemen:

**DOCKET NUMBER 50-483  
CALLAWAY PLANT UNIT 1  
UNION ELECTRIC CO.  
FACILITY OPERATING LICENSE NPF-30  
PART 21 Notification – Prime Measurement Products  
Models 763 & 763A Pressure Transmitters and  
Model 764 Differential Pressure Transmitters**

Reference: Event Notification 42151, dated November 17, 2005

The enclosed report is submitted in accordance with 10CFR21.21(d)(3)(ii) notification requirements. The concern was specific to Prime Measurement Products Models 763 & 763A Pressure Transmitters and Model 764 Differential Pressure Transmitters incorrectly manufactured with commercial Zener diodes. The use of commercial Zener diodes was determined to constitute a defect per 10CFR21. All affected transmitters were identified and repaired prior to being placed in service. Details are provided in the attached report. If you have any questions, please contact Mr. David R. Waller at 573/676-8595.

This letter does not contain new commitments.

Sincerely,

A handwritten signature in black ink that reads "Keith D. Young".

Keith D. Young  
Manager, Regulatory Affairs

Enclosures

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700 Galleria Parkway  
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## PART 21 NOTIFICATION

This letter completes the Part 21 Notification regarding PRIME (formerly ITT Barton) Models 763 & 763A Pressure Transmitters and Model 764 Differential Pressure Transmitters. An initial notification was completed November 18, 2005 as Event Notification Number 42151.

As reported, SGT LLC, primary contractor for Steam Generator replacements at Callaway Plant, received an Advisory Letter (attached) on November 2, 2005 from PRIME Measurement Products, (formerly ITT Barton) of a manufacturing defect in Model 763, 763A, and 764 pressure transmitters involving use of Zener diodes that were not in compliance with purchase specifications. Subsequently, on November 3, 2005, SGT LLC notified AmerenUE Callaway Plant of the potential manufacturing defects involving the aforementioned transmitters.

These transmitters provide input to steam generator level indication and control functions. SGT LLC purchased 22 of the suspect transmitters for use in the Callaway Plant Steam Generator replacement project. Six additional suspect transmitters had been supplied directly to Callaway Plant. Physical inspections by SGT LLC and Callaway Plant staff determined 21 of the transmitters had the commercial Zener diodes installed.

The Advisory Letter provided by PRIME stated the purchasing specifications required JANTX components, but in some cases commercial variations of the required parts were used to manufacture some transmitters. This condition was potentially reportable under 10 CFR 21, depending on the specific application at facilities using these instruments manufactured by PRIME Measurement Products. Per the information provided by PRIME, all other affected customers and the NRC had been notified.

The following is a summary of the information obtained from PRIME Measurement Products:

1. This notification involves 76 specific transmitters manufactured between February 10, 2004 and September 19, 2005.
2. Each transmitter contains two Zener diodes which may not comply with purchase specifications.
3. The JANTX Zener diodes are different in appearance with respect to the commercial variations. Some JANTX Zener diodes used in the recent past have bodies that are solid orange or light blue in color or clear glass. The commercial Zener diodes in question have a clear glass body. The commercial Zener diode is larger (0.095" diameter X 0.275" long) than the smaller JANTX Zener diode (0.072" diameter X .155" long).

4. The existence of the commercial Zener diode can be confirmed by removal of the transmitter electronics cover and observing the Zener diodes at locations CR2 and CR3, as shown on manufacturer supplied circuit board drawings.
5. The Zener diodes are not field replaceable, as it is necessary to electronically reestablish the calibration zero which will likely necessitate replacement of a calibration resistor. This calibration resistor is located in a temperature sensitive portion of the electronic circuit and requires thermal performance validation.
6. PRIME believes that transmitters with commercial Zener diodes that are currently installed in a plant can be relied upon to continue to operate and perform their safety-related function in the event of an accident. This belief is based on the facts that the commercial Zener diodes installed in any transmitter have been shown to be functional at the accident maximum sustained temperature and because the radiation effects on commercial Zener diodes are known to be within the margin of the original Barton qualification.

On November 16, 2005, Callaway Plant staff completed evaluations and determined the use of commercial Zener diodes constituted a defect per 10 CFR 21, requiring initial notification to the NRC within two days. This was based upon the conclusion that accuracy drift associated with the commercial Zener diode was greater than the value used in the existing Callaway setpoint calculation.

The affected transmitters were returned to PRIME where the commercial Zener diodes were replaced with qualified Zener diodes and proper transmitter operation was verified. The affected transmitters have since been returned to Callaway as fully qualified for safety related use in nuclear applications, and where installed are currently in service.

The concern was identified while Callaway Plant was shutdown for a refueling outage when the transmitters were installed, and prior to being returned to service. Therefore, no other reporting criteria apply.



November 2, 2005

SGT Ltd.  
SGT Warehouse  
Junction CC & Highway O  
Fulton, MO 65251

Attention: D. J. Taylor

Subject: Nuclear Industry Advisory

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PRIME Measurement Products, formerly Barton Instrument Systems & ITT Barton, is a supplier of basic components to the commercial nuclear power industry. The specific components being reported are Model 763 & Model 763A Gage Pressure Transmitters and Model 764 Differential Pressure Transmitters.

PRIME has identified that some Model 763, 763A and 764 transmitters were manufactured using Zener diodes that were not compliant with the design specifications. While the purchasing specifications called for JANTX components, commercial variations of the required parts were used to manufacture some transmitters.

The attached advisory identifies a condition that might be reportable under 10CFR21 depending on the specific application and the procedures in effect at each facility using the instruments manufactured by PRIME. We are notifying you of this situation to allow a determination of the safety significance to be made. PRIME Measurement Products apologizes for any inconvenience this situation causes. A copy of this notification will be made available to the Nuclear Regulatory Commission.

The attached notification identifies the specifics of our concerns and recommends factory rework of all problem transmitters. Recent thermal and radiation testing on commercial Zener diodes show that these parts perform within acceptable limits considering the margin available in the original qualification thereby supporting continued operation of currently installed transmitters until suitable replacements can be obtained.

Questions regarding this issue should be addressed to Mark Larson, Nuclear & Government Product Engineering Manager, at (626) 961-2547, extension 228.

Sincerely,

Bradley W. Spahr  
President and CEO

Attachment: 5 pages

# **PRIME Measurement Products, LLC**

## **NUCLEAR INDUSTRY ADVISORY**

November 2, 2005

### **Barton Model 763, Model 763A and Model 764 Zener Diodes**

PRIME Measurement Products, formerly Barton Instrument Systems & ITT Barton, is a supplier of basic components to the commercial nuclear power industry. The specific components being reported are Barton Model 763 & 763A Gage Pressure Transmitters and Barton Model 764 Differential Pressure Transmitters. PRIME sells these transmitters as fully functional LOCA qualified devices.

PRIME has identified that some Model 763, 763A and 764 transmitters were manufactured using a commercial variation of a Zener diode that should have been a JANTX device. This situation occurred as a result of a purchasing problem and was not discovered during receipt inspection / part dedication process.

PRIME has identified that the first commercial Zener diodes of concern arrived into our stock system on February 10, 2004. No transmitters with the commercial Zener diodes have been shipped from the factory since September 19, 2005. All Models 763, 763A and 764 transmitters shipped between these dates need to be considered a potential problem. The 76 specific transmitters of concern are identified in the attached listing.

There were still 69 JANTX Zener diodes in stock at the time the commercial diodes were added to stock. Therefore, some of the transmitters of concern identified in this notification may not have the commercial Zener diodes installed. Each transmitter has two Zener diodes so it is very likely that at least 34 of the reported 76 transmitters are not actually problems. In addition, there is a possibility that some other circuit boards with JANTX Zener diodes had already been assembled but not tested prior to the time the commercial Zener diodes went to stock. This situation would further reduce the population of transmitters with commercial Zener diodes.

The JANTX Zener diodes are different in appearance with respect to the commercial variations. Some JANTX Zener diodes used in the recent past have bodies that are solid orange or light blue in color or clear glass. The commercial Zener Diodes that have been used have a body that is clear glass. The attached photo compares the larger commercial Zener diode (0.095" diameter X 0.275" long) with the smaller JANTX Zener diode (0.072" diameter X .155" long) that has a glass body. The existence of the commercial Zener diode can be verified by visual inspection. Remove the transmitter electronics cover and visually observe the Zener diodes at locations CR2 and CR3 as shown on the attached drawing of the circuit board.

All Zener diodes have passed factory performance testing at 340°F (the maximum sustained PWR LOCA temperature) prior to transmitter shipment. Therefore there is a high degree of confidence that the transmitters shipped with commercial Zener diodes will perform at the accident temperatures as intended.

The original Barton qualifications for the transmitters allowed a 200 Mrad radiation induced shift of  $\pm 10\%$  while the actual radiation induced shift experienced did not exceed 2.2%. Radiation testing at 200 Mrads total equivalent gamma exposures performed on the commercial Zener diodes demonstrates that they will contribute only an additional 0.34% in transmitter radiation induced accuracy degradation. Furthermore, the radiation testing performed on the commercial Zener diodes demonstrates that the thermal performance of these parts is not degraded by the radiation exposure maintaining the validity of the transmitter factory temperature compensation process.

PRIME believes that transmitters with commercial Zener diodes that are currently installed in a plant can be relied upon to continue to operate and perform their safety-related function in the event of an accident. This belief is based on the facts that the commercial Zener diodes installed in any transmitter

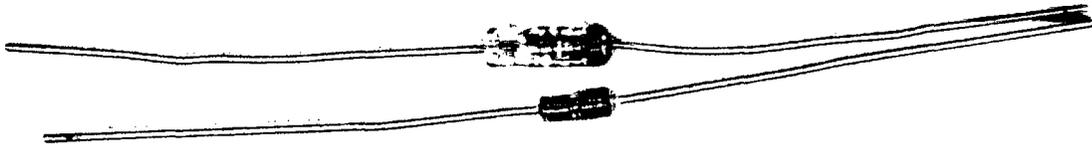
·have been shown to be functional at the accident maximum sustained temperature and because the radiation effects on commercial Zener diodes are known to be within the margin of the original Barton qualification.

Although the commercial Zener diodes perform within acceptable limits, they do not perform as well as the JANTX parts. Furthermore, while PRIME believes that our manufacturing processes screen parts for performance similar to the MIL SPEC applicable to the JANTX parts, we have not performed thermal aging and other tests to validate the qualified life of the commercial Zener diodes. PRIME is therefore offering to rebuild the transmitters containing the commercial Zener diodes, at no customer expense, using two new JANTX Zener diodes. It is recommended that all transmitters with commercial Zener diodes be returned to the factory for Zener diode replacement as soon as practicable. In this replacement, the transmitters will be recalibrated and temperature compensated to the original transmitter factory performance requirements and as tested nuclear qualified configuration.

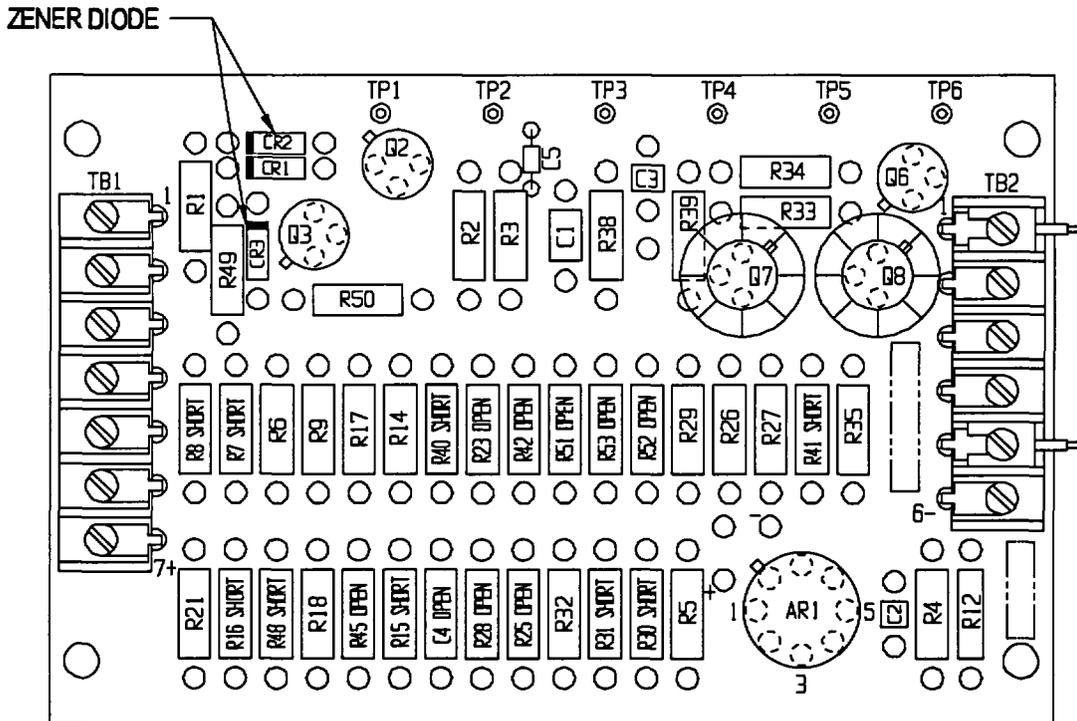
The Zener diodes are not field replaceable, as it is necessary to electronically reestablish the calibration zero which will likely necessitate replacement of a calibration resistor. This calibration resistor is located in a very temperature sensitive portion of the electronic circuit requiring thermal performance validation.

In the event a transmitter verified to contain commercial Zener diodes can not be returned to the factory for repair because it is contaminated or can not be removed from service because of plant operability concerns please contact the factory for replacement scheduling. PRIME recognizes that these situations may represent a significant concern with regard to continued power generation for your customers and will give the repair and replacement activities associated with this issue the highest manufacturing priority. It is estimated that a diode replacement repair activity can be completed in about two weeks while manufacturing of a new transmitter can take upwards of three months depending on the range, configuration and amount of transmitters that need to be manufactured or repaired at the time.

Questions regarding this issue should be addressed to Mark Larson, Nuclear & Government Product Engineering Manager, at (626) 961-2547, extension 228. To schedule transmitter repairs and replacements please contact Mabel Loo, Contracts Administration Manager, at (626) 937-0335.



**Larger Commercial Zener Diode & Smaller Similar Glass Body JANTX Zener Diode**



**Model 763, 763A and 764 Circuit Board Drawing Showing Zener Diode Locations**

Customer	Model	S/N	Customer PO	Prime Order
Alabama Power (Farley)	764	5564	QP040574	28894
Barton, United Kingdom (British Energy)	763	2471	ZP00647	28788
	763	2472	ZP00647	28788
	763	2473	ZP00647	28788
	763	2474	ZP00647	28788
	763	2475	ZP00647	28788
	764	4298	29678	25595
British Energy	764	5604	SZB-40148872	32159
NAVICP	764	5547	N00104-04-C7028	28181
	764	5548	N00104-04-C7028	28181
	764	5582	N00104-04-PBQ88	29857
	764	5583	N00104-04-PBQ88	29857
	764	5584	N00104-04-PBQ88	29857
	764	5585	N00104-04-PBQ88	29857
	764	5599	N00104-04-C7028	28181
Entergy (Waterford 3)	763A	418	10045946	25832
First Energy (Beaver Valley)	763A	424	45139403	30414
Fluid Controls (TPC)	764	5555	T41061PR	27891
	764	5556	T41061PR	27891
	764	5557	T41061PR	27891
	764	5558	T41061PR	27891
	764	5562	T41061PR	27891
	764	5563	T41061PR	27891
KHNP	764	5606	K040374471	30921
	764	5607	K040374471	30921
SGT Ltd. (Callaway)	764	5564	9221-3881	29475
	764	5565	9221-3881	29475
	764	5566	9221-3881	29475
	764	5567	9221-3881	29475
	764	5568	9221-3881	29475
	764	5569	9221-3881	29475
	764	5570	9221-3881	29475
	764	5571	9221-3881	29475
	764	5572	9221-3881	29475
	764	5573	9221-3881	29475
	764	5574	9221-3881	29475
	764	5575	9221-3881	29475
	764	5576	9221-3881	29475
	764	5577	9221-3881	29475
	764	5578	9221-3881	29475
	764	5579	9221-3881	29475
	764	5580	9221-3881	29475
	764	5581	9221-3881	29475
	764	5600	34430-1005-PO	30985
	764	5601	34430-1005-PO	30985
764	5602	34430-1005-PO	30985	
764	5603	34430-1005-PO	30985	

<b>Customer</b>	<b>Model</b>	<b>S/N</b>	<b>Customer PO</b>	<b>Prime Order</b>
Union Electric (Callway)	764	5608	198001 SR	31597
	764	5609	198001 SR	31597
	764	5610	198001 SR	31597
	764	5611	198001 SR	31597
	764	5612	198001 SR	31597
	764	5613	198001 SR	31597
Electrobras Termonuclear S.A.	764	5586	4500060123	30915
Westinghouse	764	5587	4500148633	30125
	764	5588	4500148633	30125
	764	5589	4500149482	30308
	764	5590	4500149482	30308
	764	5591	4500149482	30308
	764	5592	4500149482	30308
	764	5593	4500149482	30308
	764	5594	4500149482	30308
	764	5595	4500149482	30308
	764	5596	4500149482	30308
	764	5597	4500149482	30308
	764	5598	4500149482	30308
	764	5605	4500154485	31037
	763A	419	4500117146	24997
	763A	420	4500117146	24997
	763A	421	4500117146	24997
	763A	422	4500117146	24997
	763A	423	4500145093	29541
	763A	425	4500117165	25035
	763A	426	4500117165	25035
	763A	427	4500117165	25035
	763A	428	4500117165	25035