Duke Power
A Duke Energy Company

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May 25, 2001

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

Subject: Duke Energy Corporation
Catawba Nuclear Station, Units 1 and 2
Docket Numbers 50-413 and 50-414
Proposed Technical Specifications and Bases Amendment
1.1, Definitions, Response Time
3.3.1, Reactor Trip System Instrumentation
3.3.2, Engineered Safety Feature Actuation System Instrumentation

In accordance with the provisions of 10 CFR 50.90, Duke Energy Corporation proposes to revise the Catawba Nuclear Station Facility Operating Licenses and Technical Specifications (TS) and Bases to eliminate periodic response time testing requirements on selected sensors and selected protection channels.

The proposed amendment modifies TS Section Definitions for "ENGINEERED SAFETY FEATURE (ESF) RESPONSE TIME" and "REACTOR TRIP SYSTEM (RTS) RESPONSE TIME" to provide for verification of response time for selected components provided that the components and the methodology for verification have been previously reviewed and approved by the NRC. The associated Bases revisions to the Surveillance Requirements clarify that allocations for sensor response times may be obtained from: 1) historical records based on acceptable response time tests; 2) in place, onsite, or offsite (e.g., vendor) test measurements; or 3) utilizing vendor engineering specifications. WCAP-13632-P-A, Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements," provides both the technical basis for deleting periodic pressure and differential pressure sensor response time testing and the methodology for verifying the total channel response time using an allocated sensor response time. By letter dated September 5, 1995, Bruce A. Boger (NRC) to Roger A. Newton, Westinghouse Owners Group (WOG), the NRC approved WCAP-13632-P-A, Revision 2.

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In addition, the Bases revision clarifies that allocations for signal processing and actuation logic response times may also be used in the verification of the overall protection system channel response times. WCAP-14036-P-A Revision 1, "Elimination of Periodic Protection Channel Response Time Tests" provides the basis and methodology for using allocated signal processing and actuation logic response times in the overall verification of the protection system channel response times. By letter dated October 6, 1998, Thomas H. Essig (NRC) to Lou Liberatori, Westinghouse Owners Group (WOG), the NRC approved WCAP-14036-P-A, Revision 1.

The requested relaxation will result in reduced radiation exposure and maintenance testing man-hours. This results in substantial cost savings over the remaining life of the units without compromising plant safety.

The proposed change to response time testing involves tests that are performed during refueling outages. Catawba plans to implement the approved amendment during the Unit 1 End-of-Cycle 13 Refueling Outage. Consequently, Duke requests approval of the proposed changes by December 31, 2001 to support the relaxation of response time testing. Duke has determined that a 30-day implementation period will be sufficient for the approved amendment.

The contents of this amendment request package are as follows:

Attachment 1 provides marked copies of the affected TS and Bases pages for Catawba, showing the proposed changes. Attachment 2 contains reprinted pages of the affected TS and Bases pages for Catawba. Attachment 3 provides a description of the proposed changes and technical justification. Pursuant to 10 CFR 50.92, Attachment 4 documents the determination that the amendment contains No Significant Hazards Considerations. Pursuant to 10 CFR 51.22(c)(9), Attachment 5 provides the basis for the categorical exclusion from performing an Environmental Assessment/Impact Statement.

Implementation of this amendment to the Catawba Facility Operating Licenses and TS will impact the Catawba Updated Final Safety Analysis Report (UFSAR). Specifically, Section 7.1.2.4.2, "NRC Regulatory Guides," will require clarification as a result of approval of this amendment request. Necessary UFSAR revisions will be submitted to the NRC in accordance with 10 CFR 50.71(e).

In accordance with Duke administrative procedures and the Quality Assurance Program Topical Report, this proposed amendment has been previously reviewed and approved by the Catawba Plant

Operations Review Committee and the Duke Corporate Nuclear Safety Review Board.

Pursuant to 10 CFR 50.91, a copy of this proposed amendment is being sent to the appropriate state official.

Inquiries on this matter should be directed to L.J. Rudy at (803) 831-3084.

Very truly yours,

Gary R. Peterson

Gary R. Peterson

LJR/s

Attachments

Gary R. Peterson, being duly sworn, states that he is Vice President of Duke Energy Corporation; that he is authorized on the part of said corporation to sign and file with the Nuclear Regulatory Commission this amendment to the Catawba Nuclear Station Facility Operating Licenses Numbers NPF-35 and NPF-52 and Technical Specifications; and that all statements and matters set forth herein are true and correct to the best of his knowledge.

Gary R. Peterson

Gary R. Peterson, Vice President

Subscribed and sworn to me: 5-25-2001
Date

Mary P. Nelms
Notary Public

My commission expires: JAN 22, 2006
Date

SEAL

xc (with attachments):

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ATTACHMENT 1

MARKED-UP TECHNICAL SPECIFICATIONS AND BASES PAGES FOR CATAWBA

Insert for Page 1.1-3 of Catawba Units 1 and 2 TS

In lieu of measurement, response time may be verified for selected components provided that the components and the methodology for verification have been previously reviewed and approved by the NRC.

Insert for Page 1.1-5 of Catawba Units 1 and 2 TS

In lieu of measurement, response time may be verified for selected components provided that the components and the methodology for verification have been previously reviewed and approved by the NRC.

Insert for Page B 3.3.1-50 of Catawba Units 1 and 2 TS

Response time may be verified by actual response time tests in any series of sequential, overlapping or total channel measurements, or by the summation of allocated sensor, signal processing and actuation logic response times with actual response time tests on the remainder of the channel. Allocations for sensor response times may be obtained from: (1) historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests), (2) in place, onsite, or offsite (e.g. vendor) test measurements, or (3) utilizing vendor engineering specifications. WCAP-13632-P-A Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements" provides the basis and methodology for using allocated sensor response times in the overall verification of the channel response time for specific sensors identified in the WCAP. In addition, while not specifically identified in the WCAP, ITT Barton 386A and 580A-0 sensors were compared to sensors which were identified. It was concluded that the WCAP results could be applied to these two sensor types as well. Response time verification for other sensor types must be demonstrated by test.

WCAP-14036-P-A Revision 1, "Elimination of Periodic Protection Channel Response Time Tests" provides the basis and methodology for using allocated signal processing and actuation logic response times in the overall verification of the protection system channel response time. The allocations for sensor, signal conditioning and actuation logic response times must be verified prior to placing the component in operational service and re-verified following maintenance that may adversely affect response time. In general, electrical repair work does not impact response time provided the parts used for repair are of the same type and value. Specific components identified in the WCAP may be replaced without verification testing. One example where response time could be affected is replacing the sensing assembly of a transmitter.

Insert for Page B 3.3.1-51 of Catawba Units 1 and 2 TS

8. WCAP-13632-P-A Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements" Sep., 1995.

9. WCAP-14036-P-A Revision 1, "Elimination of Periodic Protection Channel Response Time Tests" Oct., 1998.

Insert 1 for Page B 3.3.2-47 of Catawba Units 1 and 2 TS

Response time may be verified by actual response time tests in any series of sequential, overlapping or total channel measurements, or by the summation of allocated sensor, signal processing and actuation logic response times with actual response time tests on the remainder of the channel. Allocations for sensor response times may be obtained from: (1) historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests), (2) inplace, onsite, or offsite (e.g. vendor) test measurements, or (3) utilizing vendor engineering specifications. WCAP-13632-P-A Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements" provides the basis and methodology for using allocated sensor response times in the overall verification of the channel response time for specific sensors identified in the WCAP. In addition, while not specifically identified in the WCAP, ITT Barton 386A and 580A-0 sensors were compared to sensors which were identified. It was concluded that the WCAP results could be applied to these two sensor types as well. Response time verification for other sensor types must be demonstrated by test.

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Insert 2 for Page B 3.3.2-47 of Catawba Units 1 and 2 TS

8. WCAP-13632-P-A Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements" Sep., 1995.

9. WCAP-14036-P-A Revision 1, "Elimination of Periodic Protection Channel Response Time Tests" Oct., 1998.

1.1 Definitions (continued)

ENGINEERED SAFETY FEATURE (ESF) RESPONSE TIME

The ESF RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ESF actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays, where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured.

INSERT

LEAKAGE

LEAKAGE shall be:

a. Identified LEAKAGE

1. LEAKAGE, such as that from pump seals or valve packing (except reactor coolant pump (RCP) seal water injection or leakoff), that is captured and conducted to collection systems or a sump or collecting tank;

2. LEAKAGE into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be pressure boundary LEAKAGE; or

3. Reactor Coolant System (RCS) LEAKAGE through a steam generator (SG) to the Secondary System;

b. Unidentified LEAKAGE

All LEAKAGE (except RCP seal water injection or leakoff) that is not identified LEAKAGE;

c. Pressure Boundary LEAKAGE

LEAKAGE (except SG LEAKAGE) through a nonisolable fault in an RCS component body, pipe wall, or vessel wall.

(continued)

1.1 Definitions (continued)

RATED THERMAL POWER (RTP)	RTP shall be a total reactor core heat transfer rate to the reactor coolant of 3411 MWt.
REACTOR TRIP SYSTEM (RTS) RESPONSE TIME	The RTS RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its RTS trip setpoint at the channel sensor until loss of stationary gripper coil voltage. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. INSERT
SHUTDOWN MARGIN (SDM)	SDM shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming: a. All rod cluster control assemblies (RCCAs) are fully inserted except for the single RCCA of highest reactivity worth, which is assumed to be fully withdrawn. With any RCCA not capable of being fully inserted, the reactivity worth of the RCCA must be accounted for in the determination of SDM; and b. In MODES 1 and 2, the fuel and moderator temperatures are changed to the nominal zero power design level.
SLAVE RELAY TEST	A SLAVE RELAY TEST shall consist of energizing each slave relay and verifying the OPERABILITY of each slave relay. The SLAVE RELAY TEST shall include, as a minimum, a continuity check of associated testable actuation devices.
STAGGERED TEST BASIS	A STAGGERED TEST BASIS shall consist of the testing of one of the systems, subsystems, channels, or other designated components during the interval specified by the Surveillance Frequency, so that all systems, subsystems, channels, or other designated components are tested during *n* Surveillance Frequency intervals, where *n* is the total number of systems, subsystems, channels, or other designated components in the associated function.
THERMAL POWER	THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The analyses model the overall or total elapsed time, from the point at which the parameter exceeds the trip setpoint value at the sensor to the point at which the equipment reaches the required functional state (i.e., control and shutdown rods fully inserted in the reactor core).

For channels that include dynamic transfer Functions (e.g., lag, lead/lag, rate/lag, etc.), the response time test may be performed with the transfer Function set to one, with the resulting measured response time compared to the appropriate UFSAR response time. Alternately, the response time test can be performed with the time constants set to their nominal value, provided the required response time is analytically calculated assuming the time constants are set at their nominal values. The response time may be measured by a series of overlapping tests such that the entire response time is measured.

INSERT

As appropriate, each channel's response must be verified every 18 months on a STAGGERED TEST BASIS. Testing of the final actuation devices is included in the testing. Testing of the RTS RTDs is performed on an 18 month frequency. Response times cannot be determined during unit operation because equipment operation is required to measure response times. Experience has shown that these components usually pass this surveillance when performed at the 18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.3.1.16 is modified by a Note stating that neutron detectors are excluded from RTS RESPONSE TIME testing. This Note is necessary because of the difficulty in generating an appropriate detector input signal. Excluding the detectors is acceptable because the principles of detector operation ensure a virtually instantaneous response. The response time of the neutron flux signal portion of the channel shall be measured from detector output or input of the first electronic component in the channel.

BASES

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1. UFSAR, Chapter 7.
2. UFSAR, Chapter 6.
3. UFSAR, Chapter 15.
4. IEEE-279-1971.
5. 10 CFR 50.49.
6. 10 CFR 50.36, Technical Specifications, (c)(2)(ii).
7. WCAP-10271-P-A, Supplement 2, Rev. 1, June 1990.

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SURVEILLANCE REQUIREMENTS (continued)

INSERT 1

ESF RESPONSE TIME tests are conducted on an 18 month STAGGERED TEST BASIS. Testing of the final actuation devices, which make up the bulk of the response time, is included in the testing of each channel. The final actuation device in one train is tested with each channel. Therefore, staggered testing results in response time verification of these devices every 18 months. The 18 month Frequency is consistent with the typical refueling cycle and is based on unit operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

This SR is modified by a Note that clarifies that the turbine driven AFW pump is tested within 24 hours after reaching 600 psig in the SGs.

SR 3.3.2.11

SR 3.3.2.11 is the performance of a COT on the NSWS Suction Transfer - Low Pit Level.

A COT is performed on each required channel to ensure the entire channel will perform the intended Function. Setpoints must be found within the Allowable Values specified in Table 3.3.1-1. This test is performed every 18 months. The Frequency is adequate based on operating experience.

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7. WCAP-10271-P-A, Supplement 1 and Supplement 2, Rev. 1, May 1986 and June 1990.

INSERT 2

ATTACHMENT 2

REPRINTED TECHNICAL SPECIFICATIONS AND BASES PAGES FOR CATAWBA

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BASES

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As appropriate, each channel's response must be verified every 18 months on a STAGGERED TEST BASIS. Testing of the final actuation devices is included in the testing. Testing of the RTS RTDs is performed on an 18 month frequency. Response times cannot be determined during unit operation because equipment operation is required to measure response times. Experience has shown that these components usually pass this surveillance when performed at the 18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

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SURVEILLANCE REQUIREMENTS (continued)

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7. WCAP-10271-P-A, Supplement 1 and Supplement 2, Rev. 1, May 1986 and June 1990.
8. WCAP-13632-P-A Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements" Sep., 1995.
9. WCAP-14036-P-A Revision 1, "Elimination of Periodic Protection Channel Response Time Tests" Oct., 1998.

ATTACHMENT 3

DESCRIPTION OF PROPOSED CHANGES AND TECHNICAL JUSTIFICATION

Proposed Changes

The current Catawba TS require measurement of response times of reactor protection and engineered safety features instrumentation channels. The proposed change would eliminate the requirement to actually measure the response times for selected components. Instead, the response times would be verified by summing allocated times for sensors, the process protection system, the nuclear instrumentation system, and the logic system. These allocated values will be added to the measured times for the actuated devices and compared to the overall analysis limits. The proposed change requires revising the TS definition for "Engineered Safety Features (ESF) Response Time" and "Reactor Trip System (RTS) Response Time" to provide for verification of response time for selected components provided that the components and the methodology for verification have been previously reviewed and approved by the NRC. The TS requirements for response time verification will continue to be implemented by RTS and ESF Surveillance Requirements. The associated Bases for these SRs are revised to clarify that allocations for pressure and differential pressure sensor response times may be derived from: (1) historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests), (2) in place, onsite, or offsite (e.g. vendor) test measurements, or (3) utilizing vendor engineering specifications. WCAP-14036-P-A Revision 1, "Elimination of Periodic Protection Channel Response Time Tests" provides the basis and methodology for using allocated signal processing and actuation logic response times in the overall verification of the protection system channel response time. The allocations for sensor, signal conditioning and actuation logic response times must be verified prior to placing the component into operational service and re-verified following maintenance that may adversely affect the response time.

Technical Justification for Proposed Change for Sensors

WCAP-13632-P-A contains the technical basis and methodology for eliminating response time testing (RTT) requirements on sensors identified in the WCAP. The technical basis and methodology were approved by letter dated September 5, 1995 from Bruce A. Boger (NRC) to Roger A. Newton (WOG). The NRC safety evaluation for WCAP-13632-P-A requires confirmation by the licensee that the generic analysis in the WCAP is applicable to their plant.

Duke has reviewed the plant data for Catawba Units 1 and 2.

With the exception of the specific sensor types noted below, the basis for eliminating periodic RTT for each sensor is discussed in the WCAP and/or the EPRI report. These reports provide justification that any sensor failure that significantly degrades response time will be detectable during surveillance testing such as calibration and channel checks.

There are two sensor types utilized at Catawba which were not included in the WCAP/EPRI study. These are the ITT Barton 386A differential pressure transmitter (used in containment pressure applications at Catawba) and the ITT Barton 580A-0 indicating switch (used in auxiliary feedwater suction pressure applications at Catawba). Appendix A to this amendment submittal contains two studies performed which show that: (1) the ITT Barton 386A and the ITT Barton 764 transmitters are essentially the same transmitter having the same response time range with the only difference being the temperature compensation design, and (2) the ITT Barton 580A and the ITT Barton 288A indicating pressure switches are similar except for different materials used in the housings and switches, and according to the manufacturer, the differences in these materials have no effect on the sensor response time. Hence, although the ITT Barton 386A and ITT Barton 580A-0 sensors were not included in the WCAP/EPRI study, their behavior is similar to other sensors which were included in the study; therefore, the results of the study apply to these sensor types as well.

In addition, in the Safety Evaluation Report included in WCAP-13632-P-A, Revision 2, the NRC required licensees to take the following actions:

(a) Perform a hydraulic RTT prior to installation of a new transmitter/switch or following refurbishment of the transmitter/switch (e.g., sensor cell or variable damping components) to determine an initial sensor-specific response time value.

Catawba Response
The Post-Maintenance Retest Manual references all RTT procedures to the instruments that require RTT post maintenance or testing. Use of this manual ensures that all new installations and refurbishments will require the appropriate RTT.

(b) For transmitters and switches that use capillary tubes, perform a RTT after initial installation and after any

maintenance or modification activity that could damage the capillary tubes.

Catawba Response
Catawba does not have any sensor that uses capillary tubing.

(c) If variable damping is used, implement a method to assure that the potentiometer is at the required setting and cannot be inadvertently changed or perform hydraulic RTT of the sensor following each calibration.

Catawba Response
Catawba does not have any sensor that uses variable damping.

(d) Perform periodic drift monitoring of all Model 1151, 1152, 1153, and 1154 Rosemount pressure and differential pressure transmitters, for which RTT elimination is proposed, in accordance with the guidance contained in Rosemount Technical Bulletin No. 4 and continue to remain in full compliance with any prior commitments to Bulletin 90-01, Supplement 1, "Loss of Fill-Oil in Transmitters Manufactured by Rosemount". As an alternative to performing periodic drift monitoring of Rosemount transmitters, licensees may complete the following actions: (1) ensure that operators and technicians are aware of the Rosemount transmitter loss of fill-oil issue and make provisions to ensure that technicians monitor for sensor response time degradation during the performance of calibrations and functional tests of these transmitters, and (2) review and revise surveillance testing procedures, if necessary, to ensure that calibrations are being performed using equipment designed to provide a step function or fast ramp in the process variable and that calibrations and functional tests are being performed in a manner that allows simultaneous monitoring of both the input and output response of the transmitter under test, thus allowing, with reasonable assurance, the recognition of significant response time degradation.

Catawba Response
Rosemount Technical Bulletin No. 4 does not apply to Catawba because the serial numbers of the Catawba transmitters are greater than 500000. Catawba's response to NRC Bulletin 90-01, Supplement 1 was reviewed and approved by the NRC in a letter dated January 27, 1995. Implementation of these proposed TS amendments will not change Catawba's response to this NRC Bulletin.

Technical Justification for Proposed Change for Protection Channels

WCAP-14036-P-A contains the technical basis and methodology for RTT requirements on protection channels identified in the WCAP. The basic justification for the elimination of periodic response time testing is based on a Failure Modes and Effects Analysis (FMEA) that: 1) determined that individual component degradation had no response time impact; or 2) identified components that may contribute to trip system response time degradation. Where potential response time impact was identified, testing was conducted to determine the magnitude of the response time degradation, or a bounding response time limit for the system or component was determined. As a result of the FMEA, the only components which were tested were the Westinghouse 7100 and 7300 Process Protection System circuit boards and modules. For the remainder of the hardware types shown in segments 2 and 3 of Figure 1 of the WCAP (e.g., NIS, Eagle 21, SSPS and relay logic), bounding response time allocations were determined. In these cases the bounding response time allocation is derived from design response time specifications for the component.

For the 7100 and 7300 process protection system circuit boards and modules, the FMEA was performed by having a circuit designer review the circuits and identify those components that may increase the response time if they degrade from their nominal value. The time response of dynamic function (i.e., lead-lag, etc.) cards is verified during periodic calibration testing and, therefore, these cards were not included in the program. Where it was necessary to provide a response time limit with component degradation, the conclusions of the FMEA were quantified by testing card and module response times with degraded components.

The FMEA does the following:

- Identifies response time sensitive components on the cards and modules via circuit analysis;

- Evaluates the impact on the response time if a component fails or degrades;

- Identifies detectability of degraded component via calibration; and

- Identifies components that impact calibration but not response time.

The analysis identified capacitors and resistors as the dominant response time sensitive components. Other tested components included diodes, zener diodes, inductors, and potentiometers. Increased capacitance tends to lead to increased response time. Manufacturers of sensitive capacitors on the printed circuit cards identified the failure mechanism and the maximum change in capacitance which could be reached before the capacitor failed. One manufacturer stated that the capacitance will not increase beyond 25% of the nominal value. All of the responses of the manufacturers provided gross estimates that capacitors identified in the 7300 circuits do not have a failure mechanism that will double the nominal capacitance. Based on this information, a conservative increase of 50% in capacitance was used to determine the maximum change in response time for capacitor degradation. Resistors were assumed to degrade to as much as 200% of the nominal resistance, which is a conservative increase based on engineering judgement.

Actual testing was used to verify and further quantify the FMEA results. The test procedures were used to verify and/or determine actual response time of the card or module with a degraded capacitor or resistor. Components of different values were substituted to simulate various degrees of degradation. The procedures required calibration checks on the card and module after each component change to determine if the calibration could or could not detect the degraded component. If the post-component change calibration inaccuracy exceeded 0.5% of span, then the degradation was considered detectable.

An input step change was used to obtain step response traces. The response time was defined as the time to reach 63% of the final output. This time is equal to the time constant of a dynamic system with a characteristic first order lag. For the 7300 cards, a slightly more conservative limit of 67% was used. In summary, the tests:

- Measured the response time of calibrated production modules and provided response time base-line data;

- Verified the analysis by measuring response times and obtaining calibration data for the card or module when the component(s) identified by analysis as having an impact on response time were degraded;

* Verified that similar results would be obtained if testing was done at a temperature that more closely modeled the rack environment; and

* Measured the response time of a simulated protection channel from input to output with components degraded.

Sections 4.2 - 4.5 of the WCAP present the results of the FMEA and testing with degraded components. The WCAP FMEA is applicable to the equipment actually installed at Catawba Units 1 and 2, and the analysis is valid for the versions of boards utilized. Testing verified that the FMEA was conservative and provided a baseline response time value for each card and module tested. Testing components with simulated degradations was deemed necessary to precisely quantify the increase in response time, because the Westinghouse 7100 and 7300 process protection system FMEAs show that components can degrade and impact response time without a corresponding calibration or functional test failure. Because the degradation would be undetectable by routine calibration testing, bounding response times with a degraded component were determined. In cases where more than one component impacted the response time, the individual response time degradation increments were summed to estimate the total response time degradation for the card. The bounding response time is justified because of its small magnitude when compared to the total response time limit for the protection channel and because the simulated degradations were grossly exaggerated.

Sections 4.6 - 4.9 of the WCAP present the results of the FMEA for the NIS, EAGLE 21, SSPS and relay logic protection system. Again, the WCAP FMEA is applicable to the equipment actually installed at Catawba Units 1 and 2, and the analysis is valid for the equipment utilized. These systems did not require testing with degraded components. In some cases, the FMEA did not identify any response time sensitive components that are subject to degradation, and in other cases the effects of component degradation are accounted for in the overall response time allocation for the system.

In Section 8, the methodology to integrate the component response time results into the determination of the limit for protection channels is presented. This information is then combined with the results of the actuated component periodic response time tests to ensure that the TS response time limits are verified.

ATTACHMENT 4

NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

No Significant Hazards Consideration Determination

As required by 10 CFR 50.91(a)(1), this analysis is provided to demonstrate that the proposed license amendments involve no significant hazards consideration.

Conformance of the proposed amendments to the standards for a determination of no significant hazards as defined in 10 CFR 50.92 is shown in the following:

1) The proposed license amendments do not involve a significant increase in the probability or consequences of an accident previously evaluated.

   This change to the TS does not result in a condition where the design, material, and construction standards that were applicable prior to the change are altered. The same RTS and ESFAS instrumentation is being used; the time response allocations/modeling assumptions in the UFSAR Chapter 15 analyses are still the same; only the method of verifying time response is changed. The proposed change will not modify any system interface and could not increase the likelihood of an accident since these events are independent of this change. The proposed activity will not change, degrade, or prevent actions or alter any assumptions previously made in evaluating the radiological consequences of an accident described in the UFSAR. Therefore, the proposed amendments do not result in any increase in the probability or consequences of an accident previously evaluated.

2) The proposed license amendments do not create the possibility of a new or different kind of accident from any accident previously evaluated.

   This change does not alter the performance of the reactor protection system (RPS) or the engineered safety features actuation system (ESFAS). All RPS and ESFAS channels will still have response time verified by test before placing the channel in operational service and after any maintenance that could affect response time. Changing the method of periodically verifying instrument response for certain RPS and ESFAS channels (assuring equipment operability) from time response testing to calibration and channel checks will not create any new accident initiators or scenarios. Periodic surveillance of these instruments will detect significant degradation in the channel characteristic. Implementation of the proposed amendments does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3) The proposed license amendments do not involve a significant reduction in a margin of safety.

This change does not affect the total system response time assumed in the safety analysis. The periodic system response time verification method is modified to allow use of actual test data or engineering data. The method of verification still provides assurance that the total system response is within that defined in the safety analysis, since calibration tests will detect any degradation which might significantly affect channel response time. Based on the above, it is concluded that the proposed license amendment request does not result in a reduction in a margin with respect to plant safety.

Based on the preceding analysis, it is concluded that elimination of periodic RTT is acceptable and the proposed license amendments do not involve a significant hazards consideration finding as defined in 10 CFR 50.92.

ATTACHMENT 5

ENVIRONMENTAL ANALYSIS

Environmental Analysis

The proposed amendments have been reviewed against the criteria of 10 CFR 51.22 for environmental considerations. The proposed amendments do not involve a significant hazards consideration, nor increase the types and amounts of effluents that may be released offsite, nor increase individual or cumulative occupational radiation exposures. Therefore, the proposed amendments meet the criteria given in 10 CFR 51.22(c)(9) for a categorical exclusion from the requirement for an Environmental Impact Statement.

APPENDIX A

APPLICABILITY STUDIES FOR ITT BARTON 386A AND ITT BARTON 580A-0 SENSORS

A. **PROBLEM:** WCAP-13632 "Elimination of Pressure Sensor Response Time Testing Requirements" does not identify ITT Model 386A as one of the instruments that does not require response time testing, however it lists ITT Barton Model 764.

B: **RELATION TO QA CONDITION:** The ITT Barton Model 386A and Model 764 are QA Condition 1.

C. **DESIGN METHOD:** This calculation will analyze the difference between ITT Model 386A and Model 764 for design and operation, and their effect on the Instrument Response Time value.

D. **APPLICABLE CODES AND STANDARDS:** 10CFR50.49, "Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants".

E. **OTHER DESIGN CRITERIA:** None applicable to this calculation.

F. **RELATED FSAR CRITERIA:** Catawba & McGuire FSAR, chapter 7, " Instrumentation and Control"

G. REFERENCES:

1. EPRI NP-7243, "Investigation of Response Time Testing Requirements".
2. Catawba & McGuire Technical Specification 4.3.1 "Reactor Trip System Instrumentation" and 4.3.2 " Engineered Safety Features Actuation System Instrumentation"
3. WCAP -13632 Rev. 2 "Elimination of Pressure Sensor Response Time Testing Requirements"
4. Technical Manual CNM-1210.04-0221-001 " DP Electronic Transmitter Model 386A"
5. Technical Manual CNM-1210.04-0255-001 " DP Electronic Transmitter Model 764"
6. Technical Manual MCM-1210.04-0092-001 " DP Electronic Transmitter Model 386A"
7. Technical Manual MCM-1210.04-0155-001 " DP Electronic Transmitter Model 764"
8. ITT Barton Letter to Mr. Brad Davis dated March 29, 1983 (Attachment 2)

H. ASSUMPTIONS: NONE

I. CALCULATION:

ITT Barton Technical Manual No. 804-4 and 88C4 for differential pressure electronic transmitters Model 386A and Model 764, respectively, describe the design and theory of operation of these transmitters as follow:

These differential pressure transmitters consist of the Differential Pressure Unit (DPU), electronic signal processing circuit, and the transmitter housing.

Differential Pressure Unit (DPU) (Attachment 1)

The mechanical actuating device for the electronic transmitter is a dual bellows assembly enclosed by a set of two pressure housings. The dual bellows assembly consist of two internally-connected bellows, a center plate, over-range valves, a temperature compensator, a strain gauge assembly and range spring assembly. The internal volume of the bellows and center plate is completely filled with a non-corrosive, low freezing point liquid and sealed.

The differential pressure range of the dual bellows type DPU is determined by the force required to move the bellows through their normal range of travel. In operation, the two bellows(which are connected by a valve shaft) move in proportion to the difference in pressure applied across the Bellows Unit Assembly. The linear motion of the bellows is picked up by the tip of the silicon strain gauge beam, which is actuated directly by the valve shaft connecting the two bellows.

If the bellows are subjected to a pressure greater than the differential pressure range of the DPU , The bellows will move through their normal range of travel, plus a small additional amount of over-travel, until the valve on the shaft seals against its valve seat. As the valve closes on the seat, it traps the fill fluid in the bellows, protecting the unit from damage or shift in calibration.

Electronic Signal Processing Circuit (Attachment 1)

The DPU senses the difference in pressure applied across the bellows unit assembly. The pressure causes a linear motion of the bellows which is mechanically transmitted to the strain gauge by the strain gauge beam. Motion of the end of the strain gauge beam tension to one and compression on the other. The gauge in tension increases in resistance, while the one under compression decreases in resistance. The two gauges are connected to form two active arms of a bridge circuit. The bridge output signal is conditioned and converted to a (4-20 or 10-50 mA) output signal by the electronic circuit of the electronic transmitter.

This circuit is basically a loop current regulating device, where the loop current is controlled by mechanical force or motion over the calibrated differential pressure range of the differential pressure unit. Within the circuit, the transmitter power supply and the load line connect in series. the current from the power supply enters the transmitter, passes through the reverse polarity diode, the a divides into two separate paths. The main current flows through the current amplifier and

I. CALCULATION (Continued):

returns to the loop. The remainder of the current passes through the electronic regulator where it again divides to take two separate paths: one to the strain gauge bridge network, the other to the signal amplifier. The bridge output signal is amplified by the signal amplifier. The output voltage of the signal amplifier is the input for the current amplifier circuit which converts this voltage to current. The amount of current is precisely regulated with a feedback network to make it proportional to the bridge current. After passing through these respective stages, the total current flows through the load and back to the power supply.

According to the manufacturer, the only difference between the ITT Barton Model 386A and Model 764 differential pressure Electronic transmitter are in manufacturing methodology. The Model 386A is temperature compensated for continuous operation up to +150 F. The Model 764 is temperature compensated for continuous operation up to +320 F. There are no material differences between the two models. (Reference 8, Attachment 2)

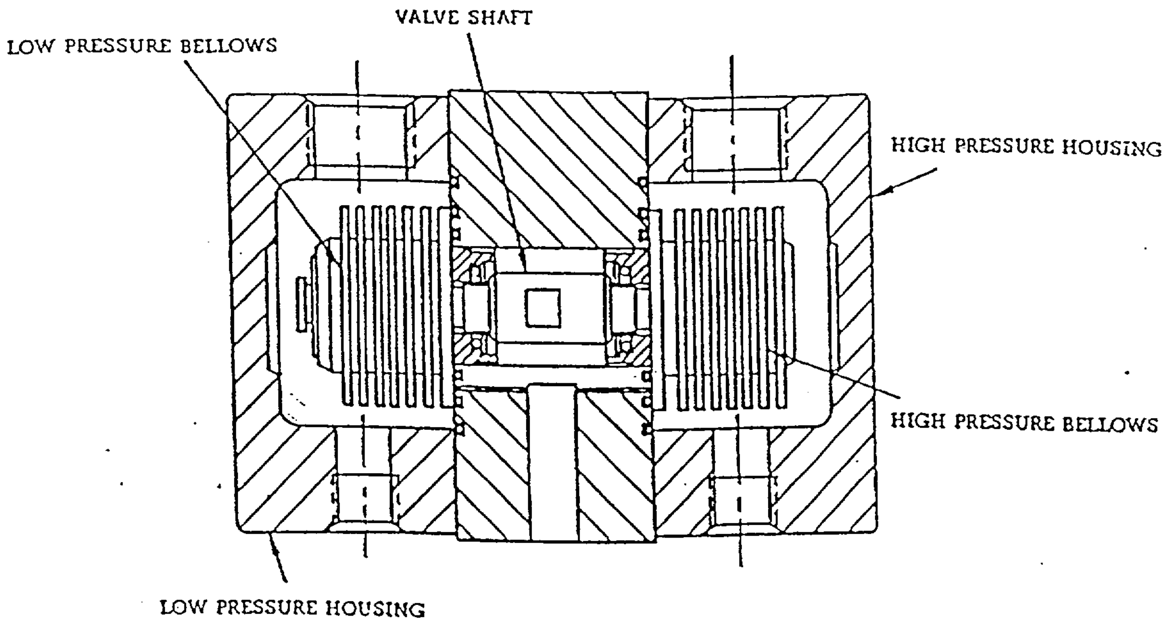
The ITT Barton Model 386A is used at McGuire in Containment Pressure and Refueling Water Storage Tank Level applications. This model is also used at Catawba in the Containment Pressure application.

Instrument Response Time is the elapsed time for the instrument to indicate a change to the measured process variable. The response time value of an instrument depends on the design of sensor (bellows) and electronic circuitry of the instrument.

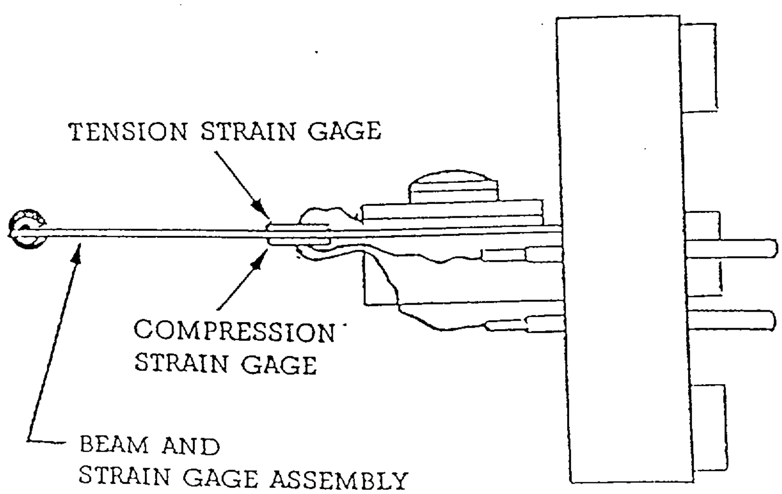
The response time value for ITT Model 386A and Model 764 transmitters is the same per ITT technical manuals stated as "less than 180 mSec. for 10% to 90% of step function."

J. CONCLUSION:

Per this analysis, ITT Barton Model 386A and ITT Barton 764 transmitters are essentially the same transmitter having the same response time range and with the only difference being temperature compensation design.

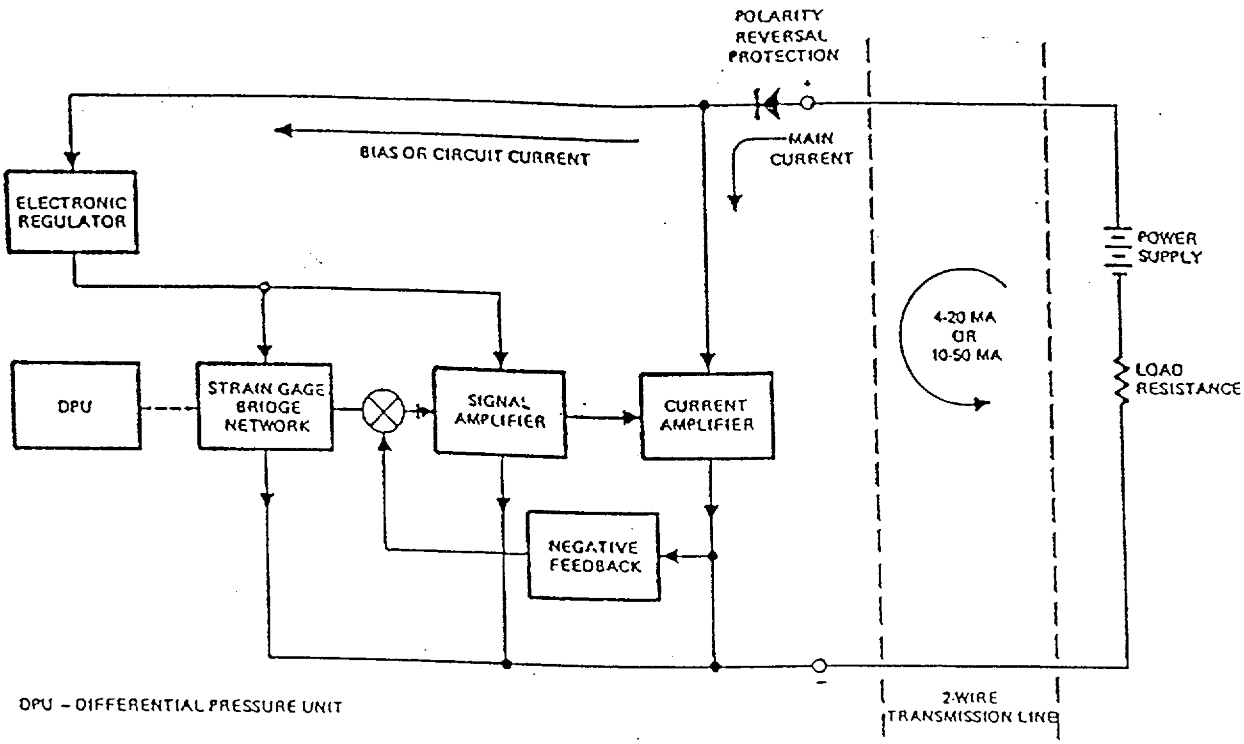


Cutaway View, Differential Pressure Unit



Strain Gage Assembly

Differential Pressure Unit DPU for Model 386A and 764.



Electronic Processing Circuit Block Diagram for Model 386A and 764

International Telephone and
Telegraph Corporation

Barton Instruments Company

900 S. Turnbull Canyon Rd.
City of Industry, CA 91749
(213) 961-2547
Telex 67-7475

March 29, 1983

Duke Power Company
Nuclear Maintenance
1236 Wachovia Center
Box 33189
Charlotte, North Carolina 28242

Attention: Mr. Brad Davis

Regarding: Model 386A and Model 764 Differences

Gentlemen:

The only differences between the ITT Barton Model 386A and the Model 764 Differential Pressure Electronic Transmitter are in manufacturing methodology. The Model 386A is temperature compensated for continuous operation up to +150°F. The Model 764 is temperature compensated for continuous operation up to +320°F. There are no material differences between the two models. The same parts and materials are used in the construction of both.

If you have any questions regarding this letter or require additional informantion, please contact me.

Sincerely,

John P. Boyon
Nuclear Market Manager

cc: D. Davis/FFP
E. Romo

smh

A. **PROBLEM:** WCAP-13632 "Elimination of Pressure Sensor Response Time Testing Requirements" does not identify ITT Model 580A as one of the instruments that does not require response time testing, however it lists ITT Barton Model 288A.

B: **RELATION TO QA CONDITION:** The ITT Barton Model 288A and Model 580A are QA Condition 1 instruments.

C. **DESIGN METHOD:** This calculation will analyze the difference between ITT Model 288A and Model 580A for design and operation, and its effect on the Instrument Response Time value.

D. **APPLICABLE CODES AND STANDARDS:** 10CFR50.49, "Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants".

E. **OTHER DESIGN CRITERIA:** None applicable to this calculation.

F. **RELATED FSAR CRITERIA:** Catawba & McGuire FSAR, chapter 7, " Instrumentation and Control"

G. REFERENCES:

1. EPRI NP-7243, "Investigation of Response Time Testing Requirements".
2. Catawba & McGuire Technical Specification 4.3.1 "Reactor Trip System Instrumentation" and 4.3.2 " Engineered Safety Features Actuation System Instrumentation"
3. WCAP -13632 Rev. 2 "Elimination of Pressure Sensor Response Time Testing Requirements"
4. Technical Manual CNM-1210.04-276 "Model 580A Differential Pressure Indicating Switch" , ITT Barton manual No. 82G9
5. Technical Manual MCM-1210.04-0165 "Models 288A & 290A Differential Pressure Indicating Switch", ITT Barton manual No. 86E9
6. Telephone Conversation Report with Brian Dearden of ITT Barton (Attachment 3)
7. Memorandum from Fluid Flow of the Carolinas (Attachment 4)

H. ASSUMPTIONS: NONE

I. CALCULATION:

ITT Barton Technical Manual No. 82G9 and 86E6 for differential pressure indicating switches ITT Model 580A and Model 288A, respectively, describe the design and theory of operation of these differential pressure indicating switches as follow:

These differential pressure indicating switches consist of the Differential Pressure Unit (DPU) and the indicating switch (case assembly).

Differential Pressure Unit (Attachment 1)

The ITT Barton Model 224 Differential Pressure Unit (DPU) is a dual bellows assembly enclosed within the pressure housings. The dual bellows assembly consists of two opposing internally connected liquid filled bellows, a center block, range spring, overrange valves, and a torque tube assembly. The pressure housings are connected by pipe or tubing to the primary devices located in the system piping. Variation in differential pressure within the pressure housings cause the bellows to expand or contract in a linear direction towards the side having the lowest pressure. The linear movement of the bellows is converted into angular rotation of the torque tube shaft by the drive arm and this mechanical motion actuates the mechanism of the process monitoring instrument. The process monitoring instrument that is connected to the torque tube assembly may be an indicator, a switch, a transmitter, a recorder, or other process control device.

Indicating Switch (Attachment 2)

The mechanical output of the DPU is transmitted to the indicating switch by the DPU torque tube shaft. The rotation of the torque tube shaft is coupled through connecting linkage within the indicating switch case to move the indicating pointer across the scale plate providing a reading of the measured process variable. An actuating cam, directly connected to the torque tube shaft, rotates with the motion of the shaft. Two cam follower roller/actuator arm assemblies, one for each switch, responds to the rotation of the torque tube shaft by opening and closing the switches as they ride onto and off of the cam. The levels of the differential pressure at which the switches actuate is adjustable with high and low alarm switch adjustments on the scale plate.

The ITT Barton Model 580A is used at Catawba in the Auxiliary Feedwater Suction Pressure application. The ITT Barton Model 288A is not currently used at either Catawba or McGuire.

Instrument Response Time is the elapsed time for the instrument to indicate a change to the measured process variable. The response time value of an instrument depends on the design of sensor (bellows) and electronic circuitry of the instrument.

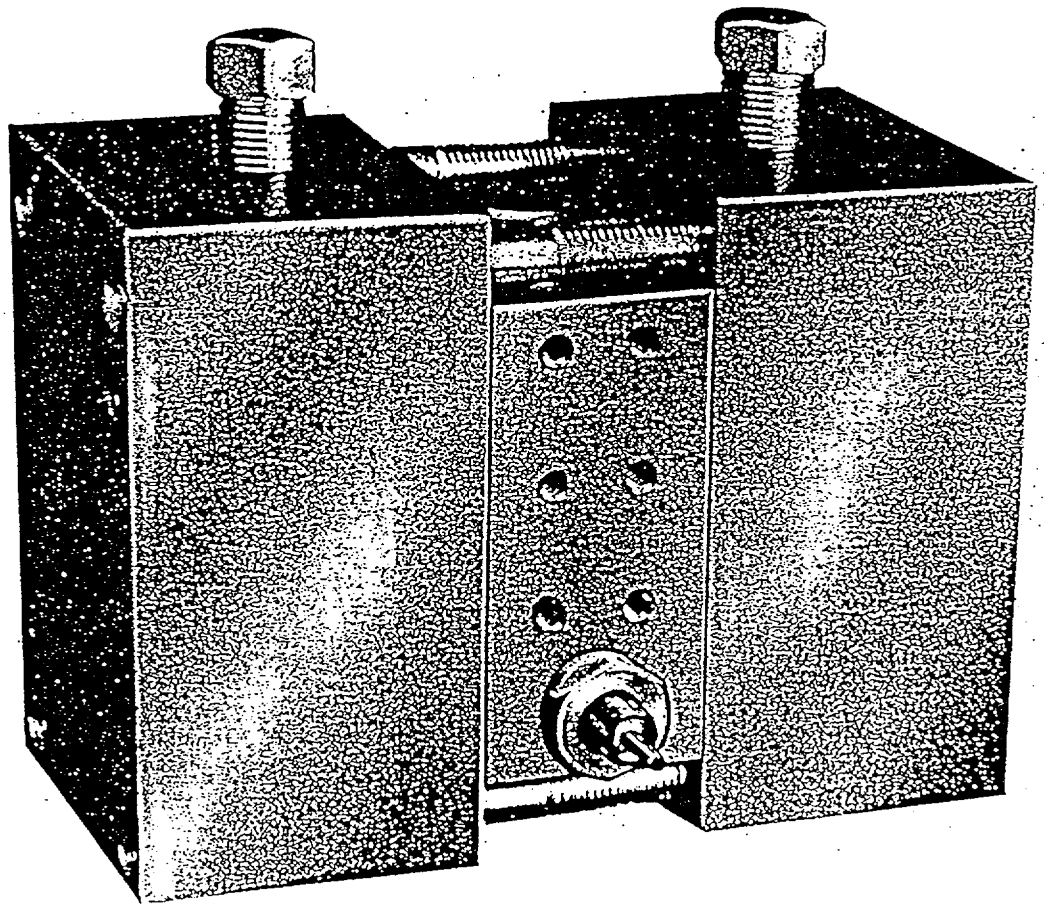
The referenced technical manuals do not reference any response time value for ITT Model 288A and Model 580A indicating pressure switches.

The EPRI report NP-7243 (Reference 1) has performed Failure Modes and Effect Analyses (FMEA) of ITT Model 288A indicating switch and has concluded that no credible failure modes were found that could affect the sensor response time. This conclusion reflects the relatively small bellows motion, the relatively large clearance around the valve stem shaft, and the direct mechanical linkages to the micro-switch cam. Any linkage problems, including friction, will result in erratic response or setpoint errors. An increase in fill fluid viscosity would act to increase response time. No mechanism, other than known temperature effects, has been identified as causing fill fluid changes. By performing the response time test at a known temperature, and comparing this to the known response time characteristic as a function of temperature; fill fluid viscosity should not be a concern for assuring technical specification compliance. The report indicates that the switch under test contained silicon fill fluid.

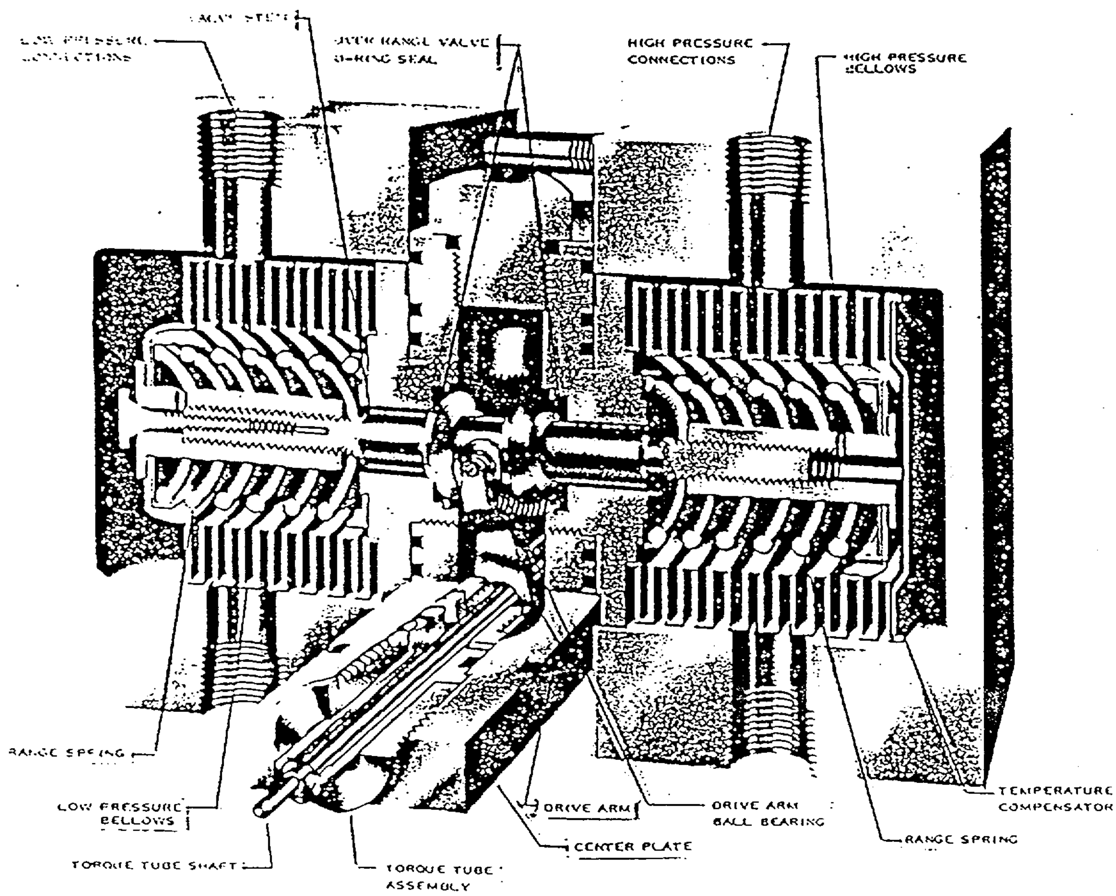
According to the manufacturer (Reference 6, Attachment 3), the differences between the ITT Barton Model 288A and Model 580A differential pressure indicating switches are the housing material, the switches' non-metallic material, and type of fill fluid used in the bellows. Fluid Flow of the Carolinas (ITT Barton local vendor) confirms (attachment 4) that the ITT Barton model 580A switches currently installed at Catawba contain silicon fill fluid.

J. CONCLUSION:

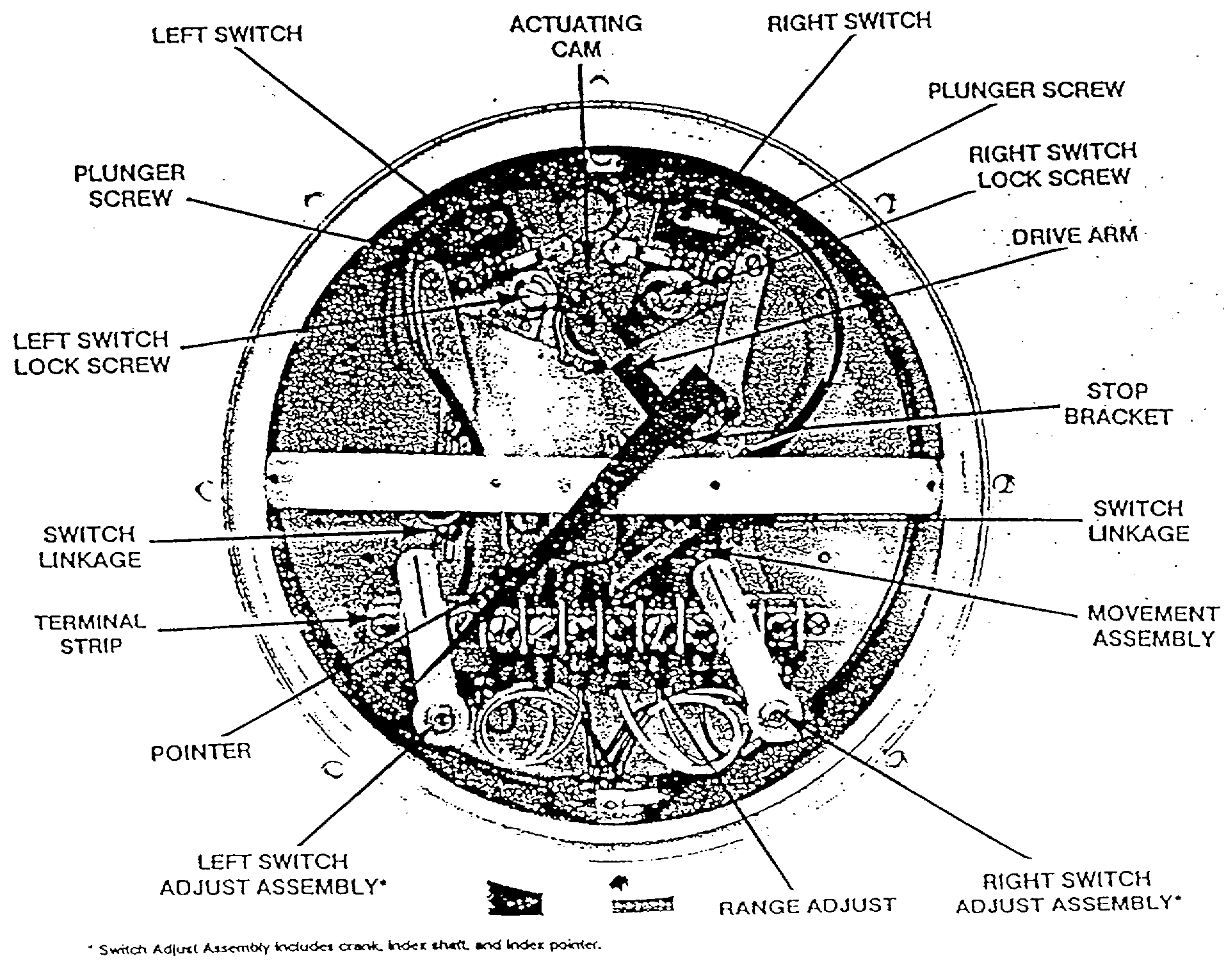
ITT Barton Model 288A and ITT Barton Model 580A indicating pressure switches are similar except for different materials used in housing and switches. According to the manufacturer the differences in these materials have no effect on response time value. Since the tested switch and the switches at Catawba both contain silicon fill fluid, the fill fluid viscosity of the installed switches is not a concern for assuring technical specification compliance.



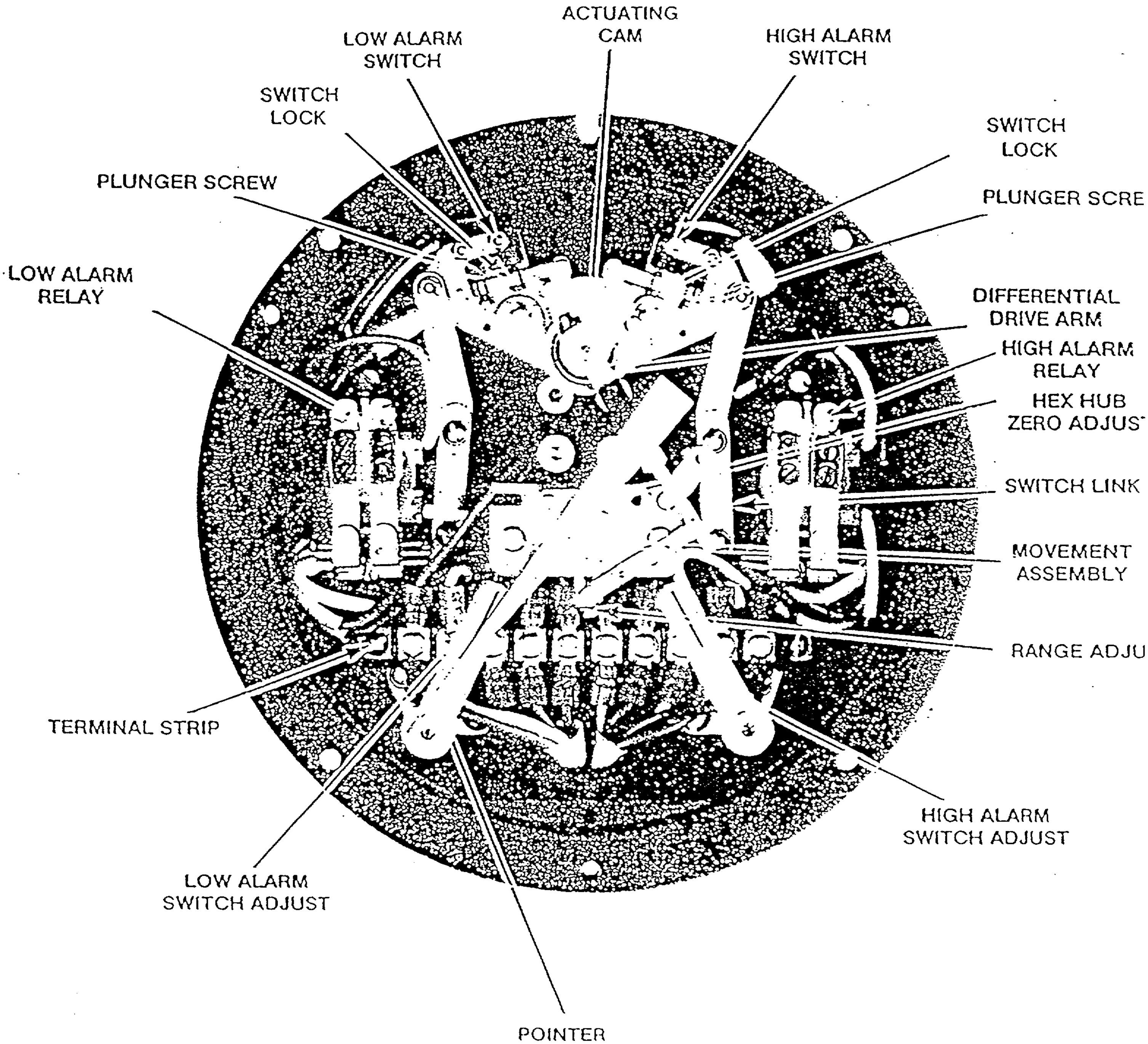
Differential Pressure Unit DPU Model 224



Differential Pressure Unit DPU -Model 224 Cut Away View



Model 580A-0 Indicating Switch Mechanism



Typical Switch Assembly for Model 288A & 290A

Duke Power Company
Telephone Conversation Report

Project: "Elimination of Response Time Testing of ITT Barton Model 580A-0"

Subject: ITT Barton Model 288A Vs Model 580A-0 Differential Pressure Switch.

Person called: Brian Dearden (ITT Barton 818-961-2547 Ext. 451)
Date: 7/23/96 Time: 11:30AM

Subject Discussed: Similarity of bellows, actuation mechanism and micro-switches

Recommendation or Resolution:
Mr. Dearden confirmed that the two switches are ~~identical~~ SIMILAR in design, construction and operation except for the followings:

	580A-0	288A
Housing:	Stainless steel	Aluminum
Fill Fluid:	Water or Silicon Oil	Mix of Water & ethylene glycol or Hydro-Carbonated Oil
Switches:	Model 580A-0 uses a higher quality of non-metallic material.	

EPRI report NP-7243 titled "Investigation of Response Time Testing Requirements" dated 3/18/94 was discussed. The objective of this report was to determine if response time testing was necessary to justify assumptions in plant safety analyses.

Mr. Dearden concurred with the following:

- The difference in the housing's construction material is irrelevant to its normal operation (for the same condition).
- The difference in the fill fluid will cause only the switch to have a shorter or a longer response time value. All fill fluids are essentially non-compressible.
- The same Differential Pressure Units (DPU) Model 224 is used in both switches.
- The EPRI's similarity analyses Failure Modes and Effects analyses (FMEAs) for ITT Model 288A will also apply to ITT Model 580A-0.

Signed: Massoud Rezapour Date: 7-24-96
Massoud Rezapour (Engineer)

Signed: [signature] Date: 7/30/96
Brian Dearden (staff Engineer)

Post-It™ brand fax transmittal memo 7671	# of pages ▸ 1
To MASSOUD REZAPOUR	From BRIAN DEARDEN
Co. DUKE POWER CO.	Co. ITT BARTON
Dept. [illegible]	Phone # [illegible]

FLUID FLOW
PRODUCTS, INC.
MEASUREMENT/CONTROL
FILTRATION

FAX TRANSMISSION

FROM: Chip Maye
Fluid Flow of the Carolinas, Inc.
2108 Crown View Drive
Charlotte, NC 28227
TEL: 704-847-4464
FAX: 704-847-2377

TO: Massoud Rezapour
Duke Power Company
P O Box 1006
Charlotte, NC 28201
FAX: 382-3993

DATE: July 31, 1996

PAGES: 1

SUBJECT: ITT Barton Model 580 & 581 Switches Purchased for Duke - Catawba Nuclear Station on Duke's PO # H50526-12 (12-22-82) - FILL FLUID

There seems to be some conflicting wording on the information in my file pertaining to the above order. Both Barton's quotation and write-up form states fill fluid "I" yet Barton's acknowledgment form states a fill fluid "S". Both are silicone fill. It was around the time of this order that Barton was changing fill fluid type codes.

I've asked Barton to clearify this for us using the serial numbers stated on the Barton forms and to explain the differences, if any, in the fill fluid codes "I" & "S".

I will notify you as soon as I receive the information from Barton.

Regards,

Chip