February 19, 1997

NOTE TO: Docket File

FROM: Joseph W. Shea, Project Manager   original signed by
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

SUBJECT: BACKGROUND DOCUMENT REGARDING CHANNEL FUNCTIONAL TEST TECHNICAL INTERFACE AGREEMENT, PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3

The attached document was provided by PECO Energy Company on July 16, 1996. The document discusses the licensee's positi., regarding channel functional testing scope. The staff considered channel functional test practices at Peach Bottom as part of a technical interface agreement request submitted by Region I on October 30, 1996.

Please place the attached document in the Peach Bottom Atomic Power Station Docket File.

Attachment: As stated

Docket Nos. 50-277/278

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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STATION POSITION ON CHANNEL FUNCTIONAL TESTING

With the implementation of ITS, there have been two interpretations of the test requirements for "CHANNEL FUNCTIONAL TEST". A channel as defined in the UFSAR section 7.1.5 is "...an arrangement of one or more sensors and associated components used to monitor plant variables and produce discrete outputs used in logic. A channel terminates and loses its identity where individual outputs are combined in logic." See figure UFSAR 7.1.1.

A channel functional test as defined in Tech Specs "shall be the injection of a simulated or actual signal into the channel as close to the sensor as practicable to verify operability, including required alarm, interlock, display, and trip functions and channel failure trips. The CHANNEL FUNCTIONAL TEST may be performed by any series of sequential overlapping or total channel steps so that the entire channel is tested."

The different interpretations impact the development of the quarterly functional test where the discrete output is the actuation of a relay used in the associated logic. One school of thought is that all contacts off the first hit relay must be tested (i.e. all contacts off the relay actuated constitute the end of the channel). The other school of thought is that the channel functional test ends at the first relay coil as would be the case if figure 7.1.1 were literally applied.

A review of the historical data associated with the original Tech Specs indicates that the primary purpose of the functional testing was to determine that components in the channel would respond to the monitored variables and produce the expected output. The expected output was/is the actuation of one or more relays outside the instrument. That the <u>instrument</u> or bistable device was intended to be tested by the functional test was clear in the original Peach Bottom Tech Spec Bases. They provided an explanation about the different sensors used and the reliability of the <u>sensors</u> or bi-stable devices used and the method of detection of failures. They also provided a methodology by which the frequency could be extended based on the number of instrument failures during the test interval. The "instrument" operability was demonstrated when the associated relay coil in the logic was energized/de-energized and the relay was actuated. Modifications to the instrumentation increased the reliability of the sensors and changed the configuration to include "trip units". With this modification came a change to the definition that allowed the injection of a simulated signal "as close to the sensor as practical". This also allowed the extension of the sensor test frequency, typically to the refueling outage calibration.

In the previous version of Tech Specs, the title for the term under discussion was "Instrument or Channel Functional Test" using the terms "Instrument" and "Channel" synonymously. Additionally, the UFSAR Channel definition states "loses its identity when combined in logic". It can be seen by review of the UFSAR figure 7.1.1 that

Attachment

the channel includes the relay coil for the contacts used in logic and not the contacts themselves. This is made clear through a review of other figures in the UFSAR.

The figures that show a single sensor provide the simplest illustration of this (Figure 7.2.10). (Figure 7.2.10 and the remainder of the figures mentioned in this part are attached). Figure 7.2.11 shows a configuration where there are eight channels. Two channels (one in each RPS system) are actuated by the same device (a single Turbine Stop Valve). In the case where the stop valve position is changed to cause a trip function (as would be required by the functional test) both channel trip functions must be included in the test. Figure 7.3.7 shows a configuration where four separate sensors are combined into one channel such that all four sensors must be demonstrated capable of producing the channel trip to have a complete functional test of the channel.

Partial print of M-1-S-65 shows a configuration where the LT-2-2-3-72A provides input to the microprocessor. The output of the microprocessor then energizes/actuates relays in various logics. A functional test of the channels associated with the instrument (LT-72A) would include actuation of all first hit relays downstream of the microprocessor. XS-2-2-3-116A OUTPUT D, is used directly in logic. There is no relay actuation that can be checked to verify microprocessor output change of state. Therefore, the logic contacts must be verified as part of the test.

In all but one case above (XS-2-2-3-116A OUTPUT D), the channel ends with actuation of the first relay with contacts used in the logic system. Once the relay has been actuated, the reliability of the testable part of the channel has been demonstrated. The reliability of the remainder of the logic system is based on the reliability of the relays and not the instruments. Because the probability of failure of one contact on the relay is no different than the probability of failure of another contact on the same relay, the test frequency for all contacts should be the same. Since the contacts used in logic (satisfying the safety function for initiation logic) are required to be tested in accordance with the logic system functional test frequency requirement, all contacts off the same relay should, at a minimum, be tested at the same frequency.

The conversion to ITS did involve "intended license changes". These were identified as either "more restrictive" or "less restrictive changes". Other changes were to be "administrative" in nature and not considered a change of intent. The change in the definition of channel functional test was identified as administrative and therefore does not constitute a change in testing requirements. Additionally, modifying tests to comply with the definition that includes all contacts would require considerable test equipment and time, both of which would not be in accordance with the guidance in the IEEE-338 description of functional test.

Therefore, based on the design of the plant and the licensing basis, any positive indication that the relay(s) used in the logic changed state is sufficient to satisfy the channel functional test requirement. Positive indication for the purposes of testing is the change of state of at least one contact on the relay as indicated by a VOM, alarm, indicating light, or slave relay actuation.

Based on the above information, it is the Station's position that Channel Functional Tests will verify actuation of ALL first hit relays (i.e. relays with contacts that either directly or through logic provide a protective action signal). The test will verify the setpoint is within the allowable value identified in Tech Spec where possible (the reactor low level scram setpoint can be checked, the control valve fast closure scram setpoint cannot). It is acceptable to determine relay actuation by either direct contact actuation or slave relay operation. How this is accomplished may vary from test to test based on the design of the system (e.g. some logic designs provide indicating lights in the logic such that the actual logic contact may be used to verify relay actuation while others provide an alarm directly from the relay). It is not acceptable to verify first hit relay actuation visually but it is acceptable to verify slave actuation visually. For cases where the instrument output is used directly in logic, the logic contact must be verified.

The combination of channel functional tests and the logic system functional test must form a complete test of ALL required relays and relay contacts. The station may find it beneficial to test more than the required amount in the channel functional test to simplify and minimize the size of the logic system functional test.

PHILADELPHIA ELECTRIC COMPANY
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UNITS 2 AND 3
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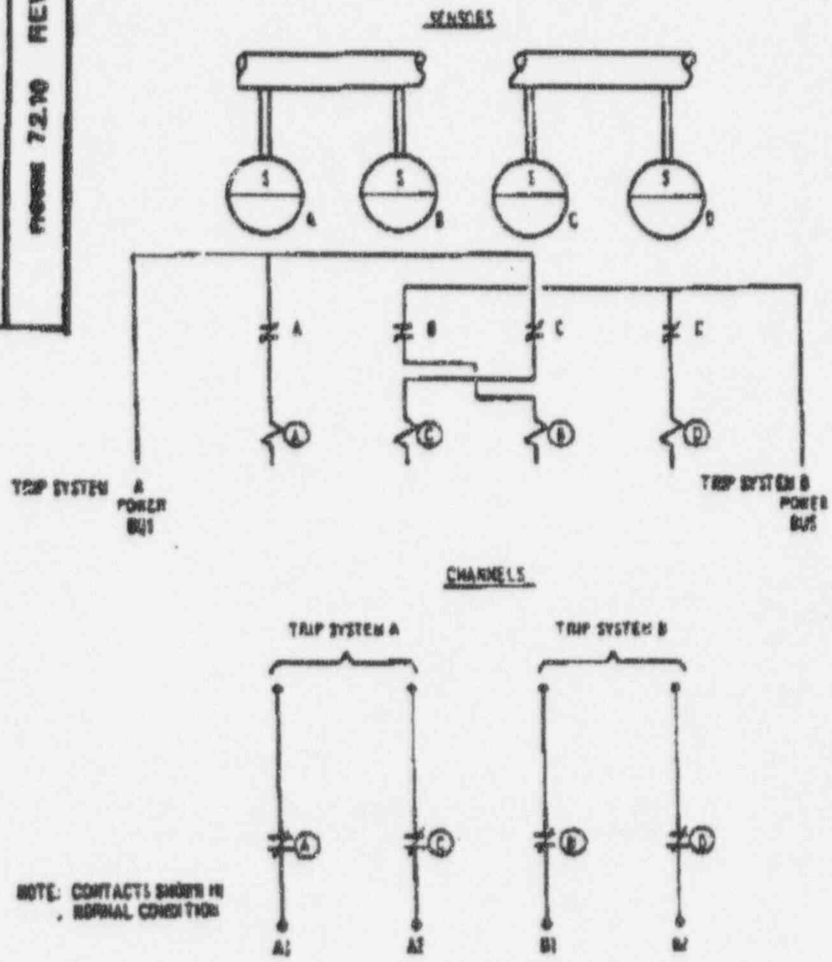
TYPICAL ARRANGEMENT OF CHANNELS AND LOGICS

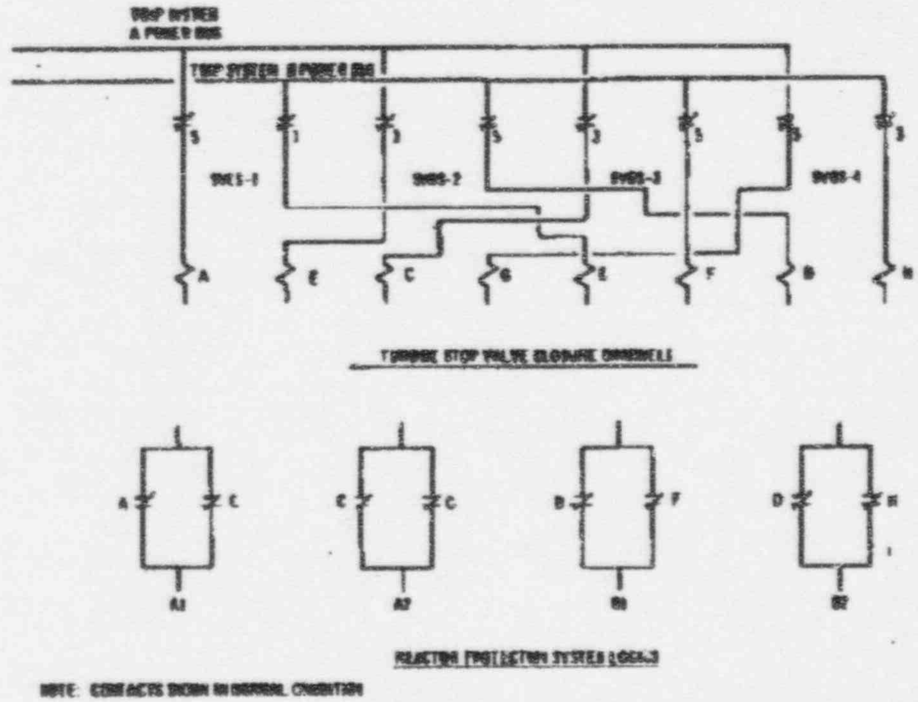
FIGURE 7.2.10 REV. 10 01/92



REACTOR PROTECTION SYSTEM LOGICS

TYPICAL CONFIGURATION FOR:
SCRAM DISCHARGE VOLUME HIGH WATER LEVEL
TURBINE CONTROL VALVE FAST CLOSURE
REACTOR VESSEL LOW WATER LEVEL
MAIN STEAM LINE HIGH RADIATION
PRIMARY CONTAINMENT HIGH PRESSURE
NUCLEAR SYSTEM HIGH PRESSURE

* A SENSOR MAY BE A SWITCH DIRECTLY ACTUATED BY A PROCESS PARAMETER, OR MAY BE A COMBINATION OF A TRIP UNIT ACTUATED BY A TRANSMITTER THAT SENSES A PROCESS PARAMETER



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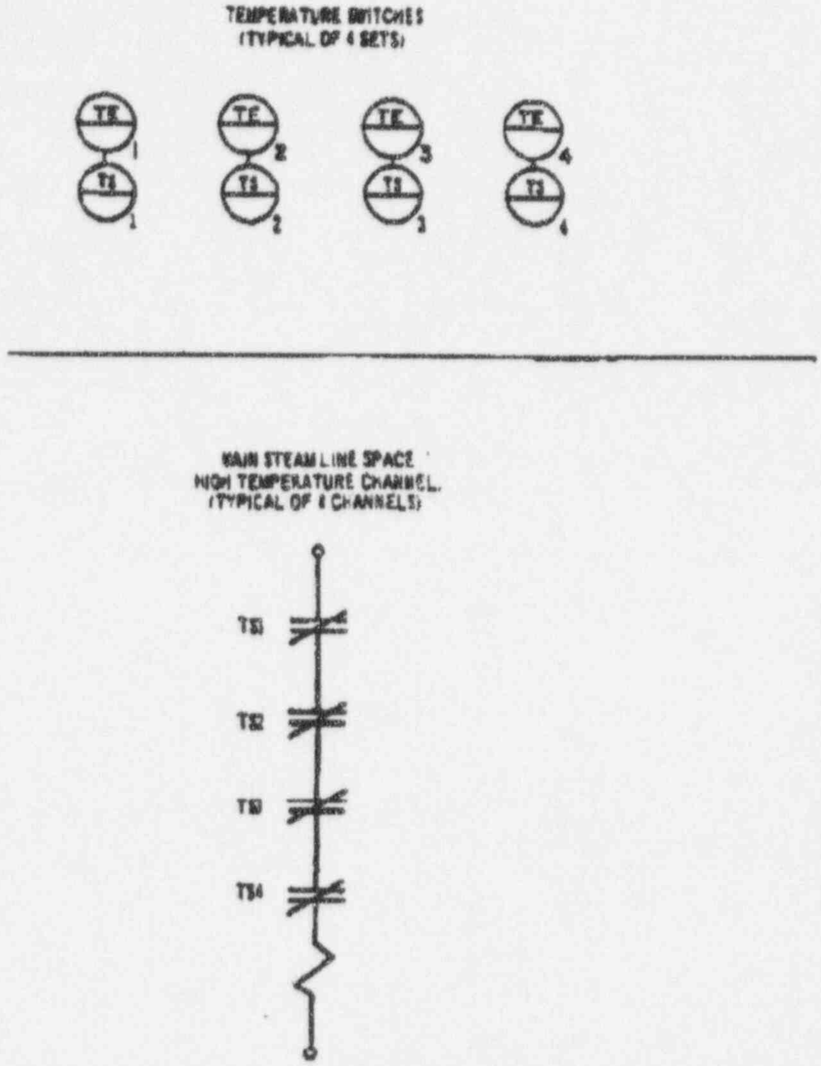
TYPICAL CONFIGURATION FOR TURBINE STOP VALVE CLOSURE SCRAM

FIGURE 7.2.11



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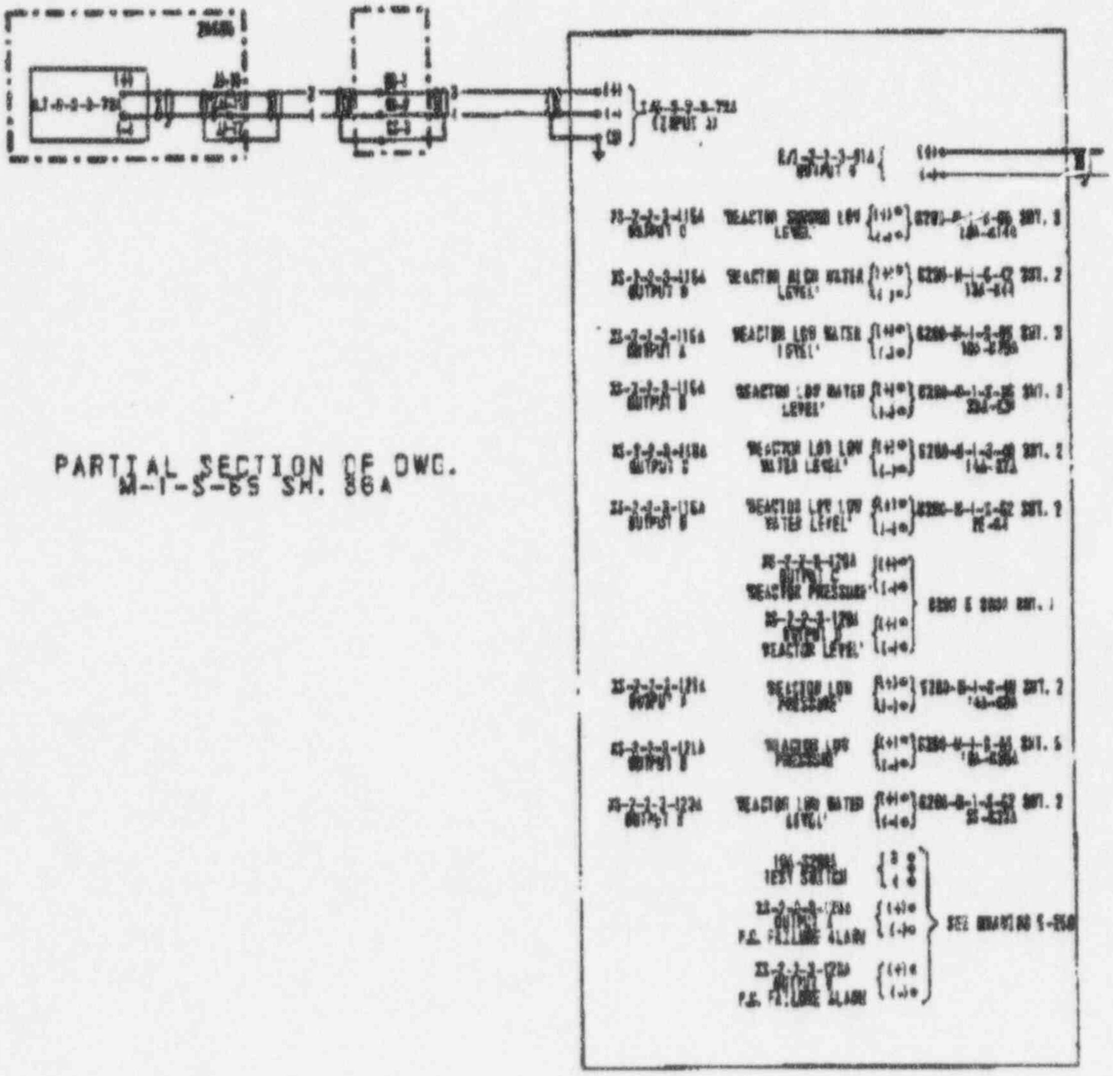
TYPICAL MAIN STEAM LINE SPACE HIGH TEMPERATURE CHANNEL

FIGURE 7.3.7



PARTIAL SECTION OF DWG. M-1-S-55 SH. 36A