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Docket No: 50-397

MEMORANDUM FOR: L. G. Hulman, Chief  
Plant Systems Branch  
Division of BWR Licensing

FROM: John N. Ridgely, Mechanical Engineer  
Plant Systems Branch  
Division of BWR Licensing

SUBJECT: TRIP REPORT - WNP-2 REVIEW OF FIRE PROTECTION FEATURES  
ASSOCIATED WITH THE FIRE PROTECTION PROGRAM AS REQUESTED  
IN TIA 86-1(B) - TAC NUMBER 60915

In support for obtaining a operating license, the licensee submitted Appendix F to the Final Safety Evaluation Report (FSAR) which provided an evaluation of the protection of the plant in the event of a fire. This appendix was reviewed and the results were documented on the Staff's Safety Evaluation Report (SER) dated March 1983, (NUREG-0892). A condition was placed on the operating license [License Condition 2.C(14)] that states: "The licensee shall maintain in effect all provisions of the approved fire protection plan". The approved fire protection plan is the plan as submitted in the FSAR and found acceptable in Section 9.5.1 of the SER and as amended in SSER #3 and SSER #4. Subsequently, the licensee proposed a change to the method of safely shutting down the facility in the event of a fire in the control room in the licensee's submittal dated March 23, 1983. As part of the licensee's review of the construction of the WNP-2 facility, the licensee initiated a re-evaluation of the plant and the design conformance with the guidelines of the Standard Review Plan (SRP) Section 9.5.1, "Fire Protection". As part of this review, the licensee identified areas of non-conformance and documented those areas in a Licensee Event Report (LER) 84-31. Since the original issuance of LER 84-31 on May 10, 1984, the licensee has provided six revisions to this LER. The fire protection program was audited by Region V at the WNP-2 site on March 3 through 7, 1986. Based on that audit and since the licensee's March 23, 1983, submittal has not been formally reviewed by NRR, the Region requested NRR assistance in evaluating several areas of the licensee's fire protection program via a Task Interface Agreement (TIA) 86-1(B) dated March 12, 1986. Based on our review, additional information was requested on May 23, 1986. The licensee provided most of the requested information in a submittal dated June 30, 1986. Based on our continuing review, a site visit was made on August 5 through 7, 1986. This trip report, then, is the report of 1) the areas at WNP-2 which were reviewed, 2) the areas of concern which were identified, and 3) the portion of the approved fire protection plan which does not appear to have been satisfied by the licensee. The enclosure provides the details on the aforementioned items.



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The following areas of concern were identified as the result of the trip to the WNP-2 site:

- \* The docketed Draft FSAR Amendment 37 contains many errors,
- \* No assurance that all safe shutdown cables have been identified and protected,
- \* A circuit overload analysis has not been performed,
- \* No specific procedure exists for safe shutdown of the facility in the event of a fire in the control room utilizing only the safe shutdown equipment identified in the approved fire protection plan,
- \* There appears to be inadequate lighting in some areas,
- \* Manual actions are required after expenditure of battery power for emergency lighting,
- \* There appears to be inadequate number of smoke detectors in some areas,
- \* Repairs are required to achieve Hot Shutdown in the event of a fire in the control room,
- \* Remote and alternate shutdown panels are poorly organized and have a poor mimic,
- \* Compliance with staff position possible while submittal states compliance is not possible, and the licensee's submittal on high/low pressure interfaces contains errors,
- \* Power for communications is through "speaker wire" which is run across the floor,

*JN Ridgely*  
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 Plant Systems Branch  
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Enclosure: As Stated

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Enclosure

WNP-2 TRIP REPORT  
RELATED TO CONFORMANCE OF THE FIRE PROTECTION FEATURES  
WITH THE APPROVED FIRE PROTECTION PROGRAM  
AUGUST 5-7, 1986

The following sections present the details of the findings associated with the trip to WNP-2 on August 5-7, 1986.

Docketed Draft FSAR Amendment 37 Contains Errors

On April 4, 1986, a draft copy of Amendment 37 to the FSAR was provided on the docket. This amendment is, essentially, a complete revision to FSAR Appendix F on fire protection. During the trip to WNP-2, another version of Amendment 37 was which is significantly different from the April 4th version. As part of the review of the revised amendment, three fire areas were reviewed to determine if the appropriate cables have been protected to assure the capability to safely shutdown the plant in the event of a fire. These were the cable chase (fire area RC-III), the remote shutdown area (fire area RC-IX), and the Division I electrical equipment room I (fire area RC-IV). In these three areas, approximately 390 cables were reviewed. In these three fire areas, all cables which were required for safe shutdown were identified and were provided appropriate protection for the effects of fires. Selected cable trays identified during the review of these three fire areas were walked down in the plant. Those cable trays reviewed in the plant were appropriately protected with respect to the specified protection identified on the electrical drawings.

Amendment 19 (dated October, 1981) incorporated the fire protection program into the FSAR. Section F.4.4.6 discusses the review of associated circuits and potential plant modifications in the past tense; i.e. "A review has been performed ..." and "... the circuit is modified." This leads one to the conclusion that all reviews and work associated with associated circuits are complete. This was clearly not evident. The licensee indicated that the revised Amendment 37 would be issued on the docket in mid-September. Although the licensee stated that the problems which were identified as part of this trip would be corrected prior to issuing Amendment 37, we have no assurance that there are no other inconsistencies.

No Assurance That All Safe Shutdown Cables Have Been Identified And Protected

During the comparative review between the revised draft of Amendment 37, the electrical drawings and the computer tabulations of cable locations, several discrepancies were identified. For example, there are cables for which one set of documents identified the cable as performing a particular function, while another set of documents identified the same cable as a spare. Another example is drawing E-747 which referenced a section view A-A for drawing E-748. However, there is no section A-A on drawing E-748. While reviewing the fire areas through which cables pass and comparing the listed fire areas with those identified in the revised Amendment 37, two types of discrepancies were identified. The first type is where a fire area was specified in Amendment 37 for a cable and the cable did not enter the specified fire area and the other type was where the



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cable entered a fire area which was not specified in Amendment 37. While none of the discrepancies were necessarily significant, the licensee did explain that the electrical contractor had considered the information on the cable pull slips to be proprietary and, therefore, black out some of the information on the cable pull slips. The licensee has a program to identify locations and protection of the cables but this program is not complete. As the result, we have no assurance that all cables have been identified and properly protected.

#### Circuit Overvoltage Analysis Has Not Been Performed

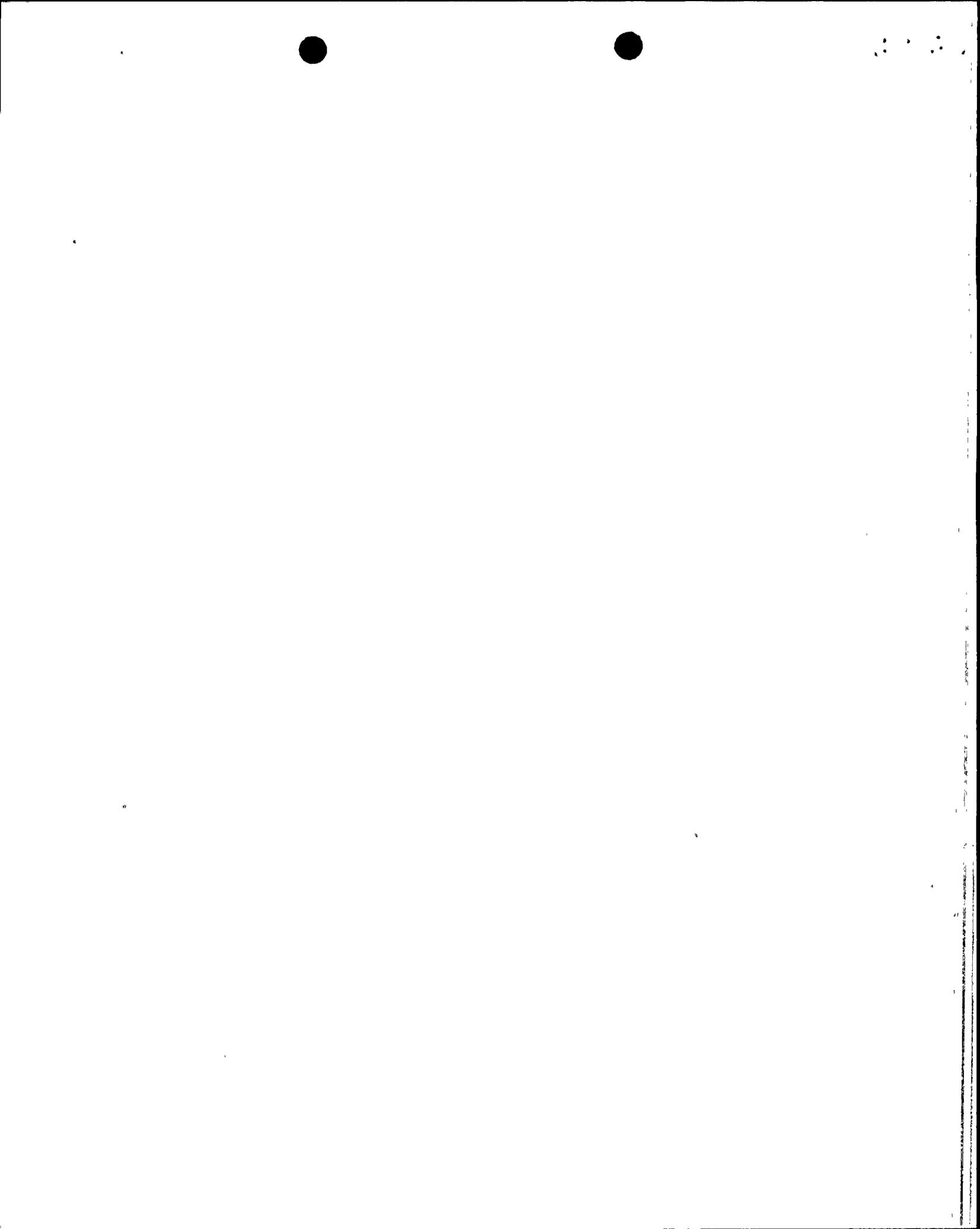
As stated in the approved fire protection plan, Section F4.4.3, one category of associated circuits which were to have been reviewed were those "circuits which receive their power from the same sources as the fire protection circuits." In the event of a fire, the electrical cable insulation could degrade and thereby result in the cable carrying the full current, up to the limit of the circuit protection device. Cables with this degraded insulation could produce currents sufficiently high to open the bus feeder breaker which feeds the affected cables. The opening of this breaker could result in removing the power from equipment needed to achieve safe shutdown of the facility. The licensee stated that the review of this type of associated circuits has not been completed. The estimated completion date is December, 1986.

#### No Specific Procedure Exists For Safe Shutdown Of The Facility In The Event Of A Fire In The Control Room Utilizing Only The Safe Shutdown Equipment Identified In The Approved Fire Protection Plan

In the SRP, Branch Technical Position (BTP) CMEB 9.5-1, Position C.5.c(3), indicates the need to have a procedure in effect to implement the alternate or dedicated safe shutdown capability for specific fire areas independently of the specific fire area. The procedures for WNP-2 are symptom-based procedures. Procedure 4.12.1.1 deals with a control room evacuation and is an abnormal condition procedure. During the site trip, an operator walked through Revision 6, the current revision, of this procedure for the event of a fire in the control room. The operator obtained this procedure from the control room set of operating procedures. This procedure is the current procedure for control room evacuations.

The licensee's fire protection plan, as evaluated and reported in Section 9.5.1.5(3) of NUREG-0892, gives credit for the operator's ability to manually scram the reactor prior to evacuating the control room. Based on past practice, this is the only action taken in the control room for which credit is given. Other actions may be possible based on the actual circumstances, but no credit is given for them as part of the BTP CMEB 9.5-1 review. The licensee's procedure identifies 11 operator actions to be performed in the control room prior to evacuation. Consistent with the BTP CMEB 9.5-1 and the licensee's FSAR commitments, this procedure should provide instructions to the operator as to the need to perform the additional 10 operator actions from outside of the control room and how the necessary actions are to be performed.

The procedure for safe shutdown in the event of a fire in the control room is intended to provide instructions for the operator such that a safe shutdown will be achieved. These instructions should cover the use of those instruments, controls, components, and systems which have been provided protection. The licensee's procedure 4.12.1.1 addresses the use of the RCIC system, which



has not been identified in Appendix F as having been provided protection from the effects of a fire in the control room. The symptom-based control room evacuation and shutdown procedure does not provide the operator with the necessary instructions to achieve safe shutdown in the event that the RCIC system is not available. The operator who walked through this procedure knew how to shutdown the plant without relying on RCIC from the remote shutdown panel. However, to his knowledge, there was no procedure which provides the necessary instructions to perform a shutdown without reliance on RCIC.

Section 9.5.1.5(3) of the SER states that the licensee would be utilizing the RCIC system as part of their alternate shutdown system in the event of a fire in the control room. Amendment 31 (dated June, 1983) to the FSAR reflects that the RCIC system would not be used to achieve safe shutdown in the event of a fire in the control room. The RCIC system may be available in the event of a control room fire and could be used to mitigate the transient on the reactor. Since the use of the RCIC has not been identified in the FSAR as an alternate safe shutdown system and the control room evacuation procedure does not provide operator instructions for safe shutdown of the plant without reliance on the RCIC system, this seems to be a major oversight.

#### Inadequate Emergency Lighting

BTP CMEB 9.5-1, paragraph C.5.g, states that lighting is "vital to safe shutdown and emergency response in the event of a fire." Furthermore, "fixed self-contained lighting consisting of fluorescent or sealed-beam units with individual 8-hour minimum battery power supplies should be provided in areas that must be manned for safe shutdown and for access and egress routes to and from all fire areas." Safe shutdown areas includes those required to be manned if the control room is evacuated. The SER states in paragraph 9.5.1.5(7) that the utility has installed an 8-hour battery pack emergency lighting unit in all areas of the plant needed for operation of safe shutdown equipment and in access and egress routes. Appendix F of the FSAR states in paragraph F.4.2 that "The WNP-2 plant complies with the 8-hour emergency lighting requirement." During the site trip, it was identified to the licensee that there appeared to be inadequate emergency lighting in various areas of the plant. Three examples are;

- \* The two battery powered lights in the remote shutdown room would provide general lighting, but would not directly illuminate the remote shutdown panel such that the identification plates may not be read easily.
- \* In the alternate remote shutdown room there were no self-contained lighting units with individual 8-hour minimum battery power supplies. In accordance with the control room evacuation procedure, one valve needs to be operated from the alternate remote shutdown panel in order to achieve cold shutdown.
- \* The SM-8 room (the room which contains the SM-8 switchgear panels) contains one battery powered light. This light would provide minimal lighting in the area and no light onto the SM-8 panels or within the SM-8 cabinets. Although the existing battery powered light is in a position which will not substantially help the operator to perform his function in the SM-8 room, it will illuminate an operator hazard. This hazard is a sharp steel angle beam corner which is not readily noticeable. If an

operator is expeditiously entering this room, there is a reasonable probability that he will run into this corner and sustain an injury and the operations which are required to be performed in this room would not be completed.

The licensee acknowledged that there was inadequate lighting in certain areas and that they were working to correct the situation.

As part of the walk-through of the control room procedure, it was obvious that there were manual actions which were required to be performed at locations other than at the remote shutdown panel. The only source of lighting in these areas is the 8-hour battery powered sealed-beam emergency lights. From the standpoint of a plant shutdown, some of the actions would probably be performed after the battery packs have been exhausted.

The guidelines in BTP CMEB 9.5-1, paragraph C.5.c(3), state that "the alternate shutdown capability shall be independent of the specific fire areas and shall accommodate postfire conditions where offsite power is not available for 72 hours." Past practice has been for utilities who do not have emergency lighting powered from a diesel generator to commit to one of the following actions in the event of a fire in the control room: 1) to be in cold shutdown within eight hours; or 2) to complete all manual actions required to be performed outside of the remote shutdown panel room in less than eight hours (preferably in two to three hours); or 3) to provide diesel powered lighting for all areas where manual actions are required and for all areas through which the operator must pass.

#### Inadequate Smoke Detectors

BTP CMEB 9.5-1, paragraph C.6.a, states that fire detector systems should comply with the requirements of Class A systems as defined in NFPA 72D, "Standard for Installation, Maintenance, and Use of Proprietary Protective Signaling Systems", Class I circuits as defined in NFPA 70, "National Electrical Code", and selected and installed in accordance with NFPA 72E, "Automatic Fire Detectors". SSER 4 paragraph 9.5.1.6(1) states that we concluded that the facility meets the guidelines of NFPA 72E and the UL listing as related to detector location and the maximum spacing being 750 square feet per detector, based on a letter from the utility dated July 1, 1983. During the site visit, it was noted that there were safety related areas which appeared to have no or an inadequate number of smoke detectors. No smoke detectors could be located in the alternate remote shutdown room and the remote shutdown room contained one smoke detector. This room contains a concrete beam which extends more than 18 inches below the ceiling. Paragraph 4-3.7.3 of NFPA 72E states that if a beam exceeds 18 inches in depth, each side of the beam should be treated as a separate area requiring at least one detector. During the plant walkdown of other fire areas, it was noted that there also seemed to be an inadequate number of smoke detectors in other fire areas.

#### Repairs Required To Achieve Hot Shutdown In The Event Of A Fire In The Control Room

BTP CMEB 9.5-1, paragraph C.5.b(1)(a), indicates that in the event of a fire, one train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or the remote shutdown areas should be assured to



be free of fire damage. Being free from fire damage is interpreted to mean that no repairs are permitted in order to achieve hot shutdown conditions. Typical repairs which have been identified to utilities during workshops and various correspondence include the pulling of fuses, jumpering of terminals, replacement of cables, and replacement of fuses. SER Section 9.5.1.5(2) states that no repairs were assumed to achieve cold shutdown in the event of a fire. The FSAR, and in particular Appendix F, did not identify any repairs that were required as the result of a fire in order to safely shutdown the plant.

The control room evacuation procedure, procedure number 4.12.1.1, Revision 6, refers the operator to Appendix C of the procedure in the event that the control room was evacuated as the result of a fire in the control room. Appendix C five identifies specific actions to be taken by the operator and requires the operator to "install short circuit screws on the short circuit strip in the current transformer shorting terminal block located in each of the (five) circuit breaker cubicles of SM-8." All of these operator actions constitute repairs which are required to achieve Hot Shutdown conditions and, therefore, are contrary to the guidelines in the BTP CMEB 9.5-1 and to the licensee's commitments in the fire protection program as documented in the FSAR. This action requires the operator to open the cabinet doors toward the only battery powered emergency light. Thus, no illumination is provided to see inside the cabinet.

The SM-8 cabinets contain the 4160 volt, 3-phase, power buss from the one diesel generator. It is from these cabinets that all of the power is provided from the diesel generator to the plant to power the safe shutdown equipment. Failure to successfully complete these operations could result in the inability to safely control the plant. Since the diesel generators automatically start upon the loss of offsite power, the diesel generator would have received a start signal by the time the operator has reached these cabinets and as a result the 4160 volt buss would be active.

BTP CMEB 9.5-1 paragraph C.5.c(5) states that "materials for such repairs shall be readily available." While this specifically addresses materials for repairs, the intent is to have all of the necessary tools readily available also. Installing the shorting screws requires the use of a screw driver. No screw driver or extra screws could be found. This does not conform to the guidelines.

Each of the five shorting terminal blocks is located in a separate cabinet and has four screws which hold a black plastic cover. The plastic cover, when in its normally installed configuration, prevents the screws from shorting the terminal blocks. The cover needs to be removed and between two to four screws need to be replaced in specific locations in the terminal block, depending on the particular cabinet's function. When the cabinet doors are opened, 4160 volt circuits are exposed on the many terminal blocks within the cabinet. Based on the intent of the staff guidelines, it appears that the above actions constitute modifications to active circuits and thereby falls into the category of repairs.

For four of these repairs, the shorting terminal block is on a side wall of the cabinet, near the front. For the repair specified in step C.2 (terminal block 1C in the cabinet CB-B/8), the shorting terminal block is located on the back wall of the cabinet and would require the operator to lean across an intervening partition containing exposed 4160 volt circuits. This operator action



poses an unreasonable safety hazard. Assuming that the operator is not electrocuted, the operator must use a screw driver to remove the four screws, remove the plastic cover, and re-insert the four screws. It seems reasonable that one or more of the screws could fall down behind the intervening partition and, therefore, could not be re-inserted into the shorting terminal block. The result could be the loss of power for safe shutdown equipment and the attended loss of control of the plant. When the licensee was informed of these concerns, the licensee stated that the "current" control room evacuation procedure was outdated and that a new procedure was currently in the review process which deleted these repairs. However, no transfer switches could be found which would replace these repairs and no copy of the "new" procedure was available. Subsequent to the trip, a conference call was held on August 20, 1986, during which the licensee stated that 1) the Revision 6 of the procedure was the current, revised procedure; 2) the repairs specified in Appendix C to the procedure will continue to be required (i.e., no transfer switches are being installed); and 3) the modifications to the SM-8 cabinet are not considered to be "repairs" in the sense of BTP CMEB 9.5-1 and Appendix R to 10 CFR 50. It is my opinion that no operator would likely survive the attempt to make the modifications to the CB-B/8 cabinet during a fire.

#### Remote And Alternate Remote Shutdown Panels Are Poorly Organized

As the shutdown procedure was being followed with an operator's assistance, it became obvious that the remote shutdown panel was poorly organized. The switches to transfer control away from the control room are interspersed with the switches to control components. Furthermore, the mimic was confusing. When following the procedure, a particular switch was called for and a significant amount of time was required to locate the appropriate switch. The operator usually found the correct switch before either Mr. C. Ramsey (Region V) or myself. An indicating light and a switch had no label to identify their functions. However, if the mimic and the panel had been properly designed, the functions could have been performed in significantly less time and the potential for confusion and error greatly reduced. The licensee indicated that this panel, in its present form, is NOT the standard General Electric Company panel because they have modified the panel.

The licensee stated that the panel was reviewed and approved by the human factors personnel of the NRC. Subsequent to this trip, I discussed this panel with the Staff's human factors personnel who were responsible for the human factor review of WNP-2 at the time that the SER was written. Based on those discussions, it seems that the remote shutdown panel was reviewed in concept only. There was no detailed review of the panel as was performed for the control room panels. In order to provide a measure of assurance that the operators can perform their functions and thereby achieve a safe shutdown of the plant, the remote shutdown panel should be re-evaluated.

#### Compliance With Staff Position Possible While Submittal States Compliance Is Not Possible, And The Licensee's Submittal On High/Low Pressure Interfaces Contains Errors

One concern related to a fire event in the control room is the potential of spurious signals being generated which could open valves in lines from the high pressure reactor system and admit high pressure reactor coolant into a low pressure system, such as the Residual Heat Removal (RHR) system. The spurious opening of such valves could result loss of coolant accident (LOCA). If the



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affected valves are not designed to close against full reactor pressure and maximum flow through the pipes, the LOCA would be unisolatable. The RHR suction line valves for most plants are not designed to close under these conditions. BTP CMEB 9.5-1, paragraph C.5.c(1), states that "during the postfire shutdown, the reactor coolant system process variables shall be maintained within those predicted for a loss of normal ac power, and the fission product boundary integrity shall not be affected; i.e., there shall be no fuel clad damage, rupture of any primary coolant boundary, or rupture of the containment boundary."

In a submittal dated July 16, 1986, the licensee provided a discussion as to why removing power from at least one isolation valve in each high/low pressure interface line is not reasonable. This letter, in part, stated that the pressure interlocks for the high/low pressure interfaces (RHR suction line: RHR-V-8 and RHR-V-9; RHR vessel return lines: RHR-V-123A & RHR-V-53A and RHR-V-123B & RHR-V53B) are located in cabinets within the control room. These valves are only necessary for limited periods of operation during shutdown operations and they are not needed during power operation or for accident mitigation. These valve pairs have one valve in each pair powered by the redundant electrical division. The cabinets are separated in the control room by electrical division. The electrical interlocks are separated, physically by panel, by approximately 42 feet. In a conference call subsequent to receipt of this submittal, the licensee stated that the distance stated in the letter was not correct.

During the site trip it was noted to the licensee that there were intervening combustibles between these two instrument racks containing the pressure interlocks. These combustibles include three duplicating machines, two printers, six boxes and two reams of paper, four file cabinets of logbooks, three cabinets of microfiche, approximately 70 three-ring notebooks, two trash cans, and a desk of unknown contents. This amount of combustible materials is characterized as significant.

The licensee stated in the July 16, 1986, submittal that removing the power from RHR-V-8 at the motor control center (MCC) would result in the loss of the primary emergency post-LOCA shutdown path. During the site trip, the FSAR drawings were reviewed and it was noted to the licensee that the MCC for RHR-V-8 could be accessible to the operators without entering the reactor building environment via an air lock. This indicates that personnel were not aware of the basic plant design features, and in particular of the plant layout. This particular MCC area is MC-S2-1A. During the walk through the plant, it was shown to the licensee that access was possible to MC-S2-1A without entering the reactor building proper. The licensee stated that this area might be accessible and upon further investigation stated that only for the design basis LOCA would MC-S2-1A be inaccessible for the first three hours of the event. After this time the operator could enter this area. Based on the observations, it seems reasonable that the operator could enter MC-S2-1A and re-energize MC-8B (for RHR-V-8) in less than one minute from the air lock and back to the air lock. Conservatively, this could be considered to be two minutes. The licensee stated that they would reconsider removing the power from RHR-V-8. Since only one valve in each high/low pressure interface line needs to have the power removed, removing the power from RHR-V-8 will bring the suction line into conformance with the guidelines BTP CMEB 9.5-1, paragraph C.5.c(1), for the RHR suction line. The licensee stated that they were already considering making the RHR-V-123A and RHR-V-123B valves inoperable since these

valves are never used, as per a recent General Electric Company analysis which shows that prewarming of the RHR return line by use of this bypass line was not necessary. Based on this information, the licensee stated that the valves RHR-V-123A and RHR-V-123B would have their power removed either at the MCC or at the valve operator inside containment. Removing the power at either place will bring the RHR return lines into conformance with the staff guidelines. Based on the existing errors in the July 16, 1986, submittal, the licensee committed to revise their submittal and to identify the removal of power from one of the isolation valves in each high/low pressure interface lines.

#### Power For Communication Is Through "Speaker Wire" Which Is Run Across The Floor

BTP CMEB 9.5-1, paragraph C.5.g, states that two-way voice communication is vital to safe shutdown and emergency response in the event of a fire. Furthermore, suitable fixed and portable communication devices should be provided which are independent of the normal plant communication systems.

During the site trip it was noted that in the remote shutdown room, power for the communication equipment is provided by means of a "speaker wire" type cable which is stretched across the floor to the remote shutdown panel. This equipment is independent of the sound powered communication equipment but is part of the control room evacuation procedure. It seems reasonable that an operator entering the remote shutdown room with only the battery powered emergency lights would probably trip over the wire and pull the "cable" loose from the plug. The anticipated result is the loss of plant communication. The operator could conceivably fall onto the floor or the nearby desk. Procedures for repairing the cable or for what action was to be taken to compensate for a potential loss of this communication equipment was unavailable.

#### Compliance With Regulatory Guide 1.68

Regulatory Guide 1.68 concerns the testing of systems and components which are important to safety to ensure that they will perform properly. To satisfy the guidelines of Regulatory Guide 1.68, the capability to safely shutdown the plant from outside the control room using the remote shutdown panel was tested in two phases. The remote shutdown panel was tested using the RCIC system, as it was originally identified in the FSAR. The Automatic Depressurization System (ADS), which is currently identified in the FSAR for bring the reactor from power operation to Hot Shutdown conditions in the event of a fire in the control room, has not been tested from the remote shutdown panel.

The first phase consisted of having the plant in hot standby conditions and maintaining reactor water level using the RCIC system. The RCIC system is not identified as a protected safe shutdown system in Appendix F of the FSAR.

The second phase took the plant from hot standby to cold shutdown using the RHR system. However, cold shutdown conditions were never actually achieved. The test was terminated after demonstrating that the reactor was being cooled down using the RHR system.

No demonstration test was performed from the remote shutdown panel which started with the reactor at power (mode 1) and achieved cold shutdown conditions using only the equipment identified in Appendix F of the FSAR.

