

SUMMARY OF POST-TMI AFW LICENSING CORRESPONDENCE

This summary was compiled by T. C. Kendall after reviewing the cited correspondence and is solely his work. It is intended as a starting point for further research or review, and does not constitute the licensee's position, or make any representations for the licensee. The compiler's notes and observations are inserted in italics.

5/11/79 NRC and WE representatives meet for a detailed discussion of the AFW system at PBNP. Minutes are transmitted in letter on 5/15/1979. The list of materials requested/provided is comprehensive, and includes system descriptions, power supplies, drawings, procedures, etc. *The scope appears to have been equivalent to an SSDI or EDSFI. It appears that the information provided formed the basis for the 9/21/1979 site specific requirements.*

9/21/79 NRC transmits site specific requirements for AFW system to PBNP. Enclosure 1 contains a system description, reliability evaluation, etc. developed by the NRC during the course of the NRR Bulletins and Orders Task Force review. Of significance:

Page 2: "SWS supply is initiated in the control room by a opening motor operated valve in the SWS to each AFW pump suction. The system is arranged such that a failure of either of the two diesel generators on site will not prevent water from being supplied to the AFW system for either unit." *Because the one remaining motor driven pump can provide flow to either unit, this is a true statement. Flow can be supplied to either unit. However, it is misleading in that it could not (and cannot) be provided to both units at the design flow rate simultaneously without invoking manual action outside of the control room.*

This appears to have been an oversight at the time of the review, and it has carried forward to the present time. Because the event of concern necessarily entails a loss of off site power (and therefore reliance on the EDGs), it is, by the definition now contained in the FSAR, a dual unit transient.

All 4 MOVs have always been powered from vital AC busses. Since there were 4 valves and only two EDGs at the time of the writing, the only way that the statement could be true is if the SWS MOVs of one MDAFP and one TDAFP were driven off of each vital bus. Initial research of the modification history shows this has never been the case; 3 of the MOVs have always been powered off of the B train of vital power. Since the installation of two additional EDGs (mid-1990s), the reliability of the facility in this respect has been significantly improved because the normal alignment separates the three SWS MOVs powered by the B train into two separate busses supplied by separate EDGs.

Ideally, the power supplied to the SW valve associated with each turbine driven AFW pump should derive from separate trains. Just which valve should derive from which train will depend upon the other supporting power requirements for the AFW pumps. In the short term, it is judged that ample time is available to locally open the associated pumps' SW supply MOVs.

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Page 3 (X.11.1.1): "Since all valves in the flow path to the steam generators are normally open and fail as-is (with the exception of PCV-1 and 2 which fail open) a loss of A-C or D-C power does not require valve manipulation...". *Here is it apparent that the concern was for delivering water to the steam generators, and that the recirculation line AOVs (which fail closed) were not of concern. Furthermore, a loss of DC power was considered acceptable provided that flow to the steam generators was not precluded or interrupted. This condition still exists; while a loss of DC power would cause losses of various indications and functions, and greatly complicate diagnosis and mitigation, it would not interrupt or preclude the ability to feed the steam generators from AFW.*

Page 4 (X.11.1.3): "Power sources for all instrumentation and controls are taken from the emergency buses which are supplied by the safety related diesel generators or safety related station batteries". *Even when expanding the scope to include the recirculation AOVs (which apparently were not considered at the time), this statement remains true. A subtlety is that the recirculation line AOV logic has a portion that, while powered from the safety related EDGs, is routed through some non-safety grade circuitry.*

Page 4 (X.11.1.4.1): "All controls for the active components of the auxiliary feedwater system can be operated from the control room". *The minimum flow recirculation line AOVs have never been controllable from the control room. Only valve position indication is in the control room. Therefore, it appears that the review did not consider the minimum recirculation line function essential for system operation/operability given the concerns at the time.*

Page 14 (X.11.3.1.6; GS-7): "The licensee should verify that the automatic start AFW system signals and associated circuitry are safety-grade". *Here, and in the subsequent sub-items, the emphasis is placed solely on automatic initiation of the system, not subsequent manual control or manipulation of the system.*

Page 16 (X.11.3.2.1): "The licensee should provide redundant level indications and low level alarms in the control room for the AFW system primary water supply to allow the operator to anticipate the need to make up water or transfer to an alternate water supply and prevent a low pump suction pressure condition from occurring. The low level alarm setpoint should allow at least 20 minutes for operator actions, assuming that the largest capacity AFW pump is operating".

Page 18 (X.11.3.3; GL-4): "Licensees having plants with unprotected normal AFW system water supplies should evaluate the design of their AFW systems to determine if automatic protection of the pumps is necessary following a seismic event or a tornado". *It is clear from these two recommendations that the NRC considered manual action for longer term activities (i.e. those longer than 20 minutes) acceptable, provided that there is adequate instrumentation available to the Operator for timely recognition and action. However, those situations that may create short-term hazards to equipment must have automatic protection/prevention schemes. One of the options suggested for plants with unprotected normal AFW supplies is an automatic low suction pressure trip of the AFW pumps. This implies that automatic tripping to protect the pump, followed by a manual action to switch over the suction source was considered acceptable (this was the solution eventually implemented by PBNP).*

10/29/79 WE responds to 9/21/79 NRC letter with various commitments and a status report. It is brief (only 4 pages), and cites the comprehensive nature of the actions and information requested, and the short response time given. Further updates committed. Of significance:

Page 3: In defending the existing configuration of CST level configuration (and refuting the need to install redundant level instruments on each tank), PBNP states that "the water supply for each operating [AFW] pump can be shifted from the primary source to the secondary source by opening a single motor operated valve controllable from the control room", and that "...because of the ease with which the AFW pump water supply can be shifted to the secondary source..." *There appears to have been no consideration, explicit or otherwise, of the potential consequences of a loss of a vital bus in these statements.*

12/17/79 WE commits to install additional AFW flow instrumentation (for flow to the steam generators) and to have an Technical Advisor.

2/4/80 WE responds to deferred items, and updates status on active items from 9/21/79 NRC letter. Of significance:

Page 3 (Recommendation GL-4): "The shifting to service water is done by operation from the main control room of one motor-driven valve per pump. Automatic switchover is not necessary on the Point Beach design. The addition of automatic pump trips on low suction pressure has been evaluated as unnecessary..." *This began a dissent with frequently contentious tone that continued for some time until final resolution.*

5/16/80 NRC responds to previous WE correspondence. Finds PBNP response unacceptable on several counts:

GS-1: Must require all 4 AFW pumps to be Operable for 2 unit operation, and 3 pumps (both motor driven and the associated turbine driven) for single unit operation.

GS-5: Emergency procedures must address cooling for TDAFW pump bearings.

GS-6: Requires independent verification of system alignments following testing or maintenance.

GL-3: Proposed modification to supply TDAFW bearing coolers from fire water is unacceptable. "No credit will be given for any operator actions outside of the control room for two hours". *NRC position was based on a misunderstanding that additional manual action would be necessary for activation of the fire water cooling. However, the citing of 2 hours for actions outside of the control room appear to be extreme, especially for a station blackout event. This limitation does not appear anywhere else, and appears to have been obviated by the more extensive station blackout rule.*

GL-4: NRC re-asserts that protection for the AFW pumps must be provided in the event of a loss of the CST due to a seismic/tornado event.

Page 4 (item D): NRC reasserts that PBNP must submit AFW system flow requirements. *Prior PBNP response was that ample information was already available from similar plants, and that PBNP need not provide plant specific information.*

- 7/8/80 WE replies to 5/16/80 NRC letter. Maintains that automatic switchover of AFW pump suction is not needed, and that the CSTs are seismically rated. No mention is made of the non-seismic structures located adjacent to or above the CST.
- 11/19/80 Internal WE memo documenting various technical questions from NRC on AFW. No significant new issues/questions.
- 1/27/81 NRC issues SER with open items for those that are still incomplete or under contention. No new positions or resolutions.
- 4/9/81 WE responds to SER. Commits to install redundant level instrumentation for each CST, and to install low suction pressure trips on the AFW pumps.
- 7/28/81 NRC issues an RAI limited to the automatic initiation and flow instrumentation for AFW (TMI Action Plan Item II.E.1.2).
- 9/16/81 WE provides specific responses to RAI of 7/28/81. No new issues identified.
- 5/21/82 NRC requires submittal of proposed changes for recommendation GS-1 (Technical Specifications upgrade) within 45 days.
- 5/3/82 NRC issues an SER contingent upon completion of committed modifications & TS changes. SER concludes that, based upon a review of the Franklin Research TER (also enclosed), the PBNP AFWS automatic initiation and flow indication systems comply with the staff's long term safety grade requirements. *Note that the emphasis has remained on automatic initiation and flow indication.*
- 7/27/82 NRC issues TS amendments to resolve GS-1.
- 2/11/83 WE updates NRC on status of modifications. No new items.
- 3/10/83 NRC internal memorandum recognizes and elucidates an operability dilemma posed when feeding one unit with a motor driven AFW pump. The corresponding pump's flow path to the other unit must be isolated, rendering that flow path inoperable. This is a new concern "created" by the new TS requirement that all 4 AFW pumps must be operable whenever both units are in operation. This was an unforeseen consequence of the TS upgrade.
- 3/24/83 WE docket correspondence documenting discussions of AFW operability when feeding one unit with a motor driven pump while the other unit is required to have an operable pump. A change to the Tech Specs is proposed.
- 5/4/83 WE provides payment for the license amendment approval fee, and requests a response to the previous correspondence of 3/24/83.
- 6/20/83 WE proposes a hardware modification that will automatically align the MDAFW Pump isolation valves to the affected unit and isolate it from the unaffected unit upon receipt of an auto-start signal.
- 9/15/83 NRC concurs with the proposed modifications.
- 11/11/83 WE notifies NRC of completion of modifications to permit testing of AFW actuation circuitry.
- 7/6/84 WE notifies NRC that the modifications proposed in the 6/20/83 letter are completed.

2/24/86 INPO issues a report "Reliability of PWR Auxiliary Feedwater Systems". Among other items, it deems installing automatic low suction pressure trips on AFW pumps a "poor practice" because of the potential for spurious trips due to simultaneous starts of multiple pumps. *PBNP implementation included a time delay to permit transient effects of a simultaneous start to pass before initiating a trip.*