

Point Beach Nuclear Plant  
**OPERABILITY DETERMINATION**  
**PART I**

**COPY**

OPR 000031

CAP 029952 / 030040 / 030209

REV 4

ENGINEERING TO COMPLETE THIS BOX WHEN OD ACCEPTED BY DSS

SYNOPSIS FOR NIM INFORMATION ONLY

Unit(s)	System	CHAMPS Equipment ID	Various
0, 1, 2	AF		

Inoperable - does not meet the minimum level of performance.  
 Operable - fully meets performance requirements. No further action required.  
 Operable But Degraded - or Operable But Nonconforming - meets the minimum required level of performances, compensatory measures ARE required.  
 Operable But Degraded - or Operable But Nonconforming - meets the minimum required level of performances, compensatory measures are NOT required.

Potential for simultaneous failure of all AFW pumps due to insufficient minimum pump flow  
 TITLE (EQUIPMENT NUMBER AND DESCRIPTION OF ISSUE)

Revision 4 of this OD incorporates CAP 030209. The power to the AFP minimum-recirculation solenoid valves for 1P-29 and 2P-29 and the control circuitry for motor driven pump P-38A (including the mini-recirculation valve for P-38A) are all derived from 125VDC bus D-01. Evaluating this situation for a design basis accident or event combined with a single failure of equipment important to safety, could challenge the operability of 1P-29, 2P-29 and P-38A since the recirculation valves use a "fail closed" design. This issue would also result in essentially the same result as plugging the mini-recirculation orifices.

Revision 3 of this OD incorporates CAP 030040. The power to the AFP minimum-recirculation solenoid valves is fed from a Safety Related DC power supply. This circuit's actuation is from a Non-Safety Related AC power source, Vital Instrument Panel 1/2Y-06. The loss of the 120VAC power supply will cause the mini-recirc valves to fail closed. Effectively the same result as plugging the mini-recirc orifice.

Revision 2 of this OD restored the original Revision 0 wording. The OD was reworded in Revision 1 on Operations request to describe the problem in terms of loss of flow through the AF recirculation line for any reason. Revision 2 restores the original wording of the problem statement to be a loss of flow through the AF recirculation line due to potential blockage of the orifice with material in the supply water.

1. Describe the condition.

*During a plant transient, a combination of the existing plant design and operating procedures may result in a failure mode of one or more AFW pumps.*

*When steam generator (SG) levels have been restored to desired levels following a transient, manual action is required to maintain those levels. This manual action could be accomplished by securing the associated pump(s), or by reducing flow to match the steaming rate. It could also be accomplished by completely closing off flow to one or both SGs if desired; this is likely to be the case if the desired level has been exceeded due to overflow, swell, etc. Isolating discharge flow to the SGs, could result in no flow through a running AFW pump since the recirculation line orifice passages are susceptible to blockage particularly when the safety related SW is aligned as the suction source. This would cause very rapid failure of these multi-stage high pressure pumps*

A1347

*As described in CAP 030040, a loss of 120VAC power from Vital Instrument panel Y-06 can result in no flow through a running AFW pump due to the recirculation line valve failing closed*

*In addition, CAP 030209 describes a condition where a loss of 125VDC bus D-01 could also fail the recirculation valves closed on 1P-29, 2P-29 and P-38A*

2. Identify the Current Licensing Basis (CLB) functions and performance requirements including

Tech Spec Reference 3.7.5

FSAR Reference 10.2. 7.3.3 4

NRC Commitment Reference \_\_\_\_\_

Other 50 59 EVAL 2002-005, FCR 02-027, FCR 02-019

If no CLB function, requirement or commitment is affected, no further action is required. N/A Steps 3, 4 and 5 and proceed with Step 6.

TS 3 75

The AFW System shall be OPERABLE with one turbine driven AFW pump system <per Unit> and two motor driven AFW pump systems when in modes 1, 2, and 3. The bases for this Technical Specification states that "The AFW System automatically supplies feedwater to the steam generators to remove decay heat from the Reactor Coolant System upon the loss of normal feedwater supply".

FSAR Chapter 10.2.1

The AFW system shall automatically start and deliver adequate AF system flow to maintain adequate generator levels during accidents which may result in main steam safety valve opening including: Loss of Normal Feedwater (LONF) and Loss of All AC Power to the Station Auxiliaries (LOAC). These accidents are evaluated in detail in sections 14.1.10 and 14.1.11 respectively.

The AF system is credited with automatically starting and delivering sufficient AF flow to maintain adequate steam generator levels during accidents which require rapid reactor coolant system cooldown to achieve cold shutdown condition within the limits of the analysis, including Steam Generator Tube Rupture (SGTR; FSAR Chapter 14.2.4), and Main Steam Line Break (MSLB; FSAR Chapter 14.2.5).

The AF system shall be capable of isolating the AF steam and feedwater supply lines from the ruptured generator following a SGTR event.

The AF system also is capable of automatically supplying sufficient feedwater to remove decay heat from both units without any reliance on AC power for one hour (station blackout).

In the event of plant fires, including those that require evacuation of the control room, the AF system shall be capable of manual initiation to provide feedwater to a minimum of one steam generator per unit at sufficient flow and pressure to remove decay and sensible heat from the reactor coolant system over the range from hot shutdown to cold shutdown conditions.

FSAR 10.2.2

This section states that each pump has an AOV controlled recirculation line back to the condensate storage tanks to ensure minimum flow to prevent hydraulic instabilities and dissipate pump heat.

FSAR 10.2.3

Based on the operating characteristics of the minimum recirculation flow control scheme, a portion of AF pumps discharge will be automatically recirculated back to the CSTs for approximately 45 seconds after the pump starts. The 45 second time delay in closing the recirculation line control valves is incorporated in the design to provide for pump stability and cooling during coastdown.

FSAR 7.3.3.4

If a loss of instrument air occurs or an Auxiliary Feedwater Pump minimum flow recirculation valve fails closed, manual operator action is required to prevent the potential failure of the pump(s). By procedure, the operator will either secure the running pump(s) or maintain forward flow through the still running pump(s) to prevent pump damage that could be caused by overheating.

Backup pneumatic supplies are provided to all AF pump minimum recirculation valves. These backup supplies are sized to provide adequate time for operators to either maintain minimum flow through the running pump(s) to secure the unneeded pump(s) if necessary to restore instrument air, or to use the manual gag on each valve to provide minimum recirculation flow.

3

Aggregate Review: Identify related issues by review of active ODs for the same system including as applicable their compensatory measures. Historical ODs can also be included in this review at the discretion of the Engineer. The review of the active ODs and their compensatory measures is to ensure there is no conflict between the related conditions, i.e., conflicting assumptions or compensatory measures

No related issues exist

Related AR Number CR 01-3648  
Impact

*Review of the condition described in section 1 of this OD indicates a potential for the loss of a flowpath for the MDAFWPs mirroring that described in OD CR 01-3648. OD CR 01-3648 describes a condition where an Appendix R fire in Fire Areas A01-B, A02, A23N and A23S, could result in the loss of MDAFP flowpath due to a fire initiated auto-start of an MDAFP with a coincident loss of off-site power and instrument air. In each of the fire areas listed above, a MDAFP is relied upon as the means of delivering Aux Feedwater to at least one Steam Generator for at least one or both Units to support decay heat removal from the RCS. This condition occurs due to a fire initiated trip of the Main Feedwater Pumps or start signal to the credited MDAFP. This auto-start signal generated by this condition opens the associated recirculation valve and motor operated discharge valve(s) for the steam generator to be supplied AF. Due to fire damage, the motor driven discharge valve may fail to open and the mini-recirc valve may fail closed due to a loss of instrument air supply.*

*The difference in the conditions described in OD CR 01-3648 and this OD is the failure mechanism of the MDAFP recirculation line, however the failure mechanism for the MDAFPs is the same. The condition described in this OD, as it pertains to Appendix R, is bounded by that described in OD CR 01-3648 because the initiating event is essentially the same for both conditions, i.e., auto-start of the MDAFP and loss of control of the motor operated discharge valve(s) for the steam generator due to fire damage. The loss of instrument air described in OD CR 01-3648 is equivalent to the recirculation line failure mechanism described in this OD because loss of instrument air is assumed for all Appendix R fires and the failure mechanism described in this OD could apply to all fire initiated starts of the MDAFPs. Therefore, failure of the MDAFPs as described in OD CR 01-3648 is the same for this condition and Appendix R operability conclusion of Operable But Nonconforming also remains the same.*

Related AR Number CR 01-3595  
Impact:

Closed. Concerns postulated failure of the recirculation line AOV. This is a related issue but it does not impact this OPR.

Related AR Number \_\_\_\_\_  
Impact:

Review additionally, as applicable, these items to help clarify current plant conditions. These items may have impact on the SSC performance.

Active Temporary Operating Procedure Changes None Applicable

Active Temporary Modifications None Applicable

Modifications currently being installed None Applicable

Recent Work Orders None Applicable

Approved DCNs None Applicable

Recently Performed Inservice Testing IT-10

- 4 Evaluate the CLB functions and performance requirements identified in Step 2 against the as-found condition and the related issues identified in Step 3. The evaluation must identify the extent to which the SSC is capable of performing its identified CLB function. Document the evaluation:

*After the automatic initiation of AF in response to an analyzed event, operators are required to manually control AF flow based on SG levels (FSAR 7.3.3.4). Manual control may include shutting pump discharge valves resulting in pump operation strictly on recirculation flow. Due to the potential debris blockage of the recirculation line restriction orifices (1/2RO-4003, RO-4008, RO-4015), sufficient flow to prevent pump damage may not be achieved.*

*Also, as described in CAP 030040, a loss of 120VAC power from Vital Instrument panel Y-06 can result in loss of recirculation flow due to the recirculation line valve failing closed. CAP 030209 describes a third condition where the loss of 125VDC bus D-01 could result in the loss of 1P-29, 2P-29 and P-38A due to the closure of the recirculation line valves.*

*Measures taken include heightened Operator awareness of the potential for pump damage (briefings with on-coming shift personnel), temporary information tags posted on the AFW pump flow controls. Revisions to operating procedures that will alert the Operator to the limitations of the AFW system with respect to minimum AFW pump flow are in progress. The revisions will ensure that AFW Minimum Flow Requirements are maintained or the affected AFW pump is secured.*

*NEMA guidelines states that motor driven pumps may be started twice from an initial standby condition with no restrictions. After the initial starts, NEMA MG-1 recommends subsequent starts after "all conditions affecting operation have been thoroughly investigated and the apparatus has been examined for evidence of excessive heating." This guidance encompasses situations where the load or prime mover may have experienced a fault which causes a failure to start or run; excessive temperatures are not expected with the equipment functioning normally. Additional starts therefore are allowed and not expected to cause machine failure. It should be recognized minimum of 3 starts of a motor driven AF pump are allowed in the first 15 minutes of operation. An additional one or two starts is allowed provided the run time is at least 15 minutes between these later starts. Motor starting nameplate information directs that after initial starts the motor may be restarted if run time has exceeded 15 minutes or it has been secured for 60 minutes. Excessive consecutive starting will decrease overall motor life. Starting duty limitations are provided by the manufacturer to provide the longest possible motor life.*

*The AOP SG control band is 29% to 65% This represents an approximate volume of 5000 gallons. At a steaming rate of 50 gpm, a motor driven pump start would be required every 50 minutes to control level within half of the control band. At maximum*

pump flow rate of 200 gpm, the pump would be operated for 16 minutes to recover the level lost while the pump was secured. Since the operation of the pumps will meet the NEMA criteria established, the pump motor will not fail as a result of repetitive starts. The pump motors are supplied from Westinghouse DB-50 Air Circuit Breakers. Vendor information indicates an in-rush, non-fault duty cycle of 750 breaker operations. The recommended operating conditions are a frequency of operation not to exceed 20 per 10 minutes or 30 per hour. Since the MDAFPs are only used during startup, shutdown (including SG chemical additions) and required system testing, the number of breaker operations are well below these operating limits. If an operator is required to secure and restart pumps during a transient, the actions would be performed at a frequency of operation much less than the recommended value for the entire transient.

There are no starting cycle limitations on the turbine driven AFW pumps. The turbine vendor was contacted and verified that no duty cycle concerns exist for this pump assembly. The steam supply MOVs are rated for 5 minutes of operation every hour which corresponds to five open/shut cycles. With a maximum steaming rate of 75 gpm, it would take approximately 33 minutes to steam off half of the control band (2500 gallons). The nameplate guidance for motors and valves is based on manufacturers' recommendations for long life and are considered conservative. Therefore, operation of the valve will not be degraded.

The recommendations of this Operability Determination is to consider the AF system OPERABLE but NON-CONFORMING. The potential Non-Conformance pertains to the FSAR statement of the minimum recirculation flow path ensuring minimum flow is available.

Note: If the SSC is determined to be inoperable based on this evaluation, mark Step 5 N/A and continue with Step 6.

5. Evaluate the need for compensatory measures. Complete with input from DSS.

- Degraded or nonconforming, however, no compensatory measures are required.
- Degraded or nonconforming. The following compensatory measures are REQUIRED in order to maintain operability.

If Compensatory Measures are not required go to Step 6.

Compensatory measures must be in place prior to OD final approval by the DSS

Affected Unit (1 OR 2 OR 0) 0

Describe the Compensatory Measure (what needs to be performed):

*As an immediate compensatory measure, a briefing of all responsible on-shift Reactor Operations staff should be conducted describing the concern and appropriate responses:*

1. *If discharge flow cannot be maintained per the applicable operating procedure(s) without exceeding desired SG level, secure the associated pump(s) and re-start again later when (if) needed.*

- 1. Install tags, placards, or otherwise post the pertinent information at the controls (in the Control Room and locally) for the associated AFW pumps
- 1. Emphasize verifying a minimum of 50 (75) gpm flow through a motor (turbine) driven pump when reducing flow as stated in the operating procedures.

Basis which indicates the Compensatory Measure maintains operability

By verifying minimum pump flow requirements, the continued availability of the AFW pumps is ensured. Minimum pump flow maintains hydraulic stability, removes pump heat and increase the life of the pump. If the minimum flow requirement cannot be maintained, then the pump will be secured to prevent damage. Repetitive operation of a motor driven or turbine driven AF pump for SG level control has been determined to be acceptable.

As an additional action, revise operating procedures as appropriate to prevent reducing flow of operating AFW pumps below the minimum flow requirements.

Implementation Mechanism (Procedure number, Temp Mod number, etc):

As determined appropriate by Operations.

Plant condition(s) or mode(s) of operation which require the Compensatory Measure:

Modes 1, 2, and 3 (modes in which decay heat removal from the SGs is necessary and required capability per ITS.

Under what conditions may the Compensatory Measure be terminated?

Engineering evaluation or modification to restore the function of the recirculation lines.

6. Prepared By:

Clint Drescher / Clint Drescher Date/Time: 11/21/02 16:00  
Name (Print) / Signature

Engineering Manager Approval of Evaluation and Proposed Compensatory Measure (if applicable)

Norman L. Hoefert / Norman L. Hoefert Date/Time: 11/21/02 16:00  
Name (Print) / Signature

7. SRO Review of Operability Documentation:

- Inoperable - does not meet the minimum level of performance.
- Operable - fully meets performance requirements. No further action required.
- Operable But Degraded - or Operable But Nonconforming - meets the minimum required level of performances, compensatory measures ARE required

- Operable But Degraded - or Operable But Nonconforming - meets the minimum required level of performances, compensatory measures are NOT required
- Evaluation Accepted
- Evaluation and Compensatory Measures Accepted
- Compensatory Measures Verified in Place.
- NP 10 1.1, LCO Tracking Log updated to include new items

DSS: By Ron HARPER [Signature] Date/Time: 11/21/02 1630  
 Name (Print) / Signature

Route ~~to~~ package to in-box in WCC for processing Package includes original Part 1, all attachments, and related condition report.