Point Beach Nuclear Plant

OPERABILITY DETERMINATION
PART I

___ CR 01 - 3595

REV 2

ENGINEERING TO COMPLETE THIS BOX WHEN OD ACCEPTED BY DSS

SYNOPSIS FOR NIM INFORMATION ONLY

Unit(s) 1 & 2 System AF CHAMPS Equipment ID various (n/a)

- ☐ 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 loss of air & directed operator action

TITLE (EQUIPMENT NUMBER AND DESCRIPTION OF ISSUE)

1. Describe the condition.
In the event of a transient that involves a loss of instrument air, a combination of the existing plant design and operating procedures may result in a failure mode of one or more AFW pumps.

The minimum recirculation flow control valves for each pump fail closed on a loss of instrument air. When steam generator (SG) levels have been restored to desired levels, manual action is directed 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 overfill, swell, etc. This last combination of events, could result in very low or no flow through a running AFW pump and would cause very rapid failure of these multi-stage high pressure pumps.

Due to the common causes (loss of instrument air and a possible operator response), there is a potential for a loss of one or more AFW pumps during an anticipated transient (loss of instrument air).

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

Tech Spec Reference 3.7.5

FSAR Reference Chapter 10.2

NRC Commitment Reference contained w/in FSAR

Other None identified

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.

A/169

ITS 3.7.5

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

The AFW system is credited for automatically starting and delivering adequate AF system flow to maintain adequate generator levels during accidents which may result in main steam safety valve opening. These accidents include: 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.

It is identified that "Each pump has an AOV controlled recirculation line back to the condensate storage tanks to ensure minimum flow to dissipate pump heat". This statement however is a description of system arrangement and not part of the design basis.

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 CR Number 01-3648
Impact: This CR addresses a similar issue resulting from an appendix R situation.

Related CR Number CAP001763
Impact: This CR questions the adequacy of a single recirculation path through AF-117.

Related CR 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 All testing per IST program is current.

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:

No degradation of any System, Structure, or Component (SSC) as defined by Part 9900 of the NRC Inspection Manual (Technical Guidance on the Resolution of Degraded and Nonconforming Conditions) has been identified.

The identified concern postulates a mechanistic failure within the license and design basis of the facility (loss of instrument air). This failure may be either an initiating event or a result of a different failure, also within the design and license basis of the facility. Any loss of instrument air is expected to also result in an AFW start signal due to a loss of normal feedwater (the normal feed water regulating valves fail closed on loss of air).

Under this postulated condition, all components of the AF system are fully capable of performing their design functions supporting automatic starting and supplying sufficient flow to the SGs to mitigate any transient or accident. However, the function of the minimum flow recirculation AOV is in question.

A PRA assessment of possible failure modes and effects has identified a significant potential increase in Core Damage Frequency (CDF) due to a previously unanalyzed mode of component failure due to a combination of a design limitation and in part to possible anticipated Operator actions. This combination

could result in failure of one or more of the AFW pumps due to aggressive AFW flow reduction (as may be expected in response to a SG overfill, swell, or SGTR) after automatic system start and flow had been established. Note however, that this postulated action is not a certainty.

The likelihood of success or failure in the postulated scenario is highly dependent upon plant transient response (which may vary with the nature of the initiating event, initial power levels, etc.) and Operator response. Operator response is highly dependent upon prior training, procedural usage, system knowledge and awareness, experience, etc. Assessing the response of the operator is beyond the scope of this Operability Determination.

However, it should be noted that a control board alarm is provided (Instrument Air Header Pressure Low) to alert the operator to the existence of an initiating condition for this event and that established plant procedures direct the restoration of instrument air (both Emergency Operating Procedures and Abnormal Operating Procedures), and the manual jacking open of the minimum flow re-circulation valves in the event that instrument air cannot be promptly restored (AOP 5B).

As of the writing of this evaluation, measures taken include heightened Operator awareness of the potential for pump damage (briefings with on-coming shift personnel) and enhancements to the Emergency Operating Procedure fold-out pages to alert the Operator to the limitations of the AFW system with respect to minimum AFW pump flow under loss of instrument air conditions. This action may result in operators stopping pumps when demand decreases to near the minimum required AFW pump flow and therefore the ability of their prime movers (motors and turbines) to sustain repeated starts is of concern. NEMA guidelines state 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 are not expected to cause machine failure. Furthermore, 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 lifetime. There are no starting cycle limitations on the turbine driven AFW pumps (governor and turbine vendors have been contacted to ensure no duty cycle concerns for the turbine exist) and motor operated turbine steam supply valves are rated for 5 minutes of operation every hour which corresponds to 5 open/shut cycles. The nameplate guidance for motors and valves is based on manufacturer's recommendations for long life and is considered conservative. Starting duty limitations, while not expected to be a factor, are provided by the manufacturer to provide the longest possible motor lifetime. Finally, the actual starting demand on a pump has been evaluated and it is expected that conservative running and rest times will be in excess of 30 minutes each.

The previously existing plant procedures (which may well have assured timely restoration of minimum recirculation flow prior to significant reductions in forward feed flow) and the recent enhancements to heighten Operator awareness and knowledge of system limitations provide reasonable assurance of Operability and Conformance at the time of this evaluation.

The AFW system was previously considered OPERABLE but NON-CONFORMING. The potential Non-Conformance ~~(additional research and evaluation of human factors involved is needed to determine the extent of issue)~~ pertains to the FSAR statement of the minimum recirculation flow path AOVs ensuring minimum flow is available to prevent overheating of the pumps. However, after the completion of corrective actions to change procedures, ~~and emphasize the potential degradation mechanism via briefings and training~~, reasonable assurance exists to support the conclusion that the Auxiliary Feed system is fully operable. The FSAR statement regarding the design and operation of the recirculation AOVs, although not meeting the definition of design basis, is still accurate and in force consistent with design information upon which PBNP was licensed. The failure of plant procedures to adequately address this potential common mode failure due to operator action in the event of loss of IA is the focus of a Root Cause Evaluation and further action from that evaluation will be addressed under the corrective action program. Further discussion of the fully operable condition of the AF system is contained in the attached memo (J. Hanna to M. Reddemann dated 8 Jan 2002).

JHT 4/27/02

4/27/02 JHT Shane Gimpel And Lori Armstrong Initial via phone con. 4/27/02.

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) _____

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

Basis which indicates the Compensatory Measure maintains operability:

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

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

Under what conditions may the Compensatory Measure be terminated?

6. Prepared By:

J. H. Hanna _____ Date/Time: 4/27/2002 12:30
Name (Print) / Signature

P. S. Gingrass _____ Date/Time: 4/27/2002
Name (Print) / Signature

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

LORI ARMSTRONG _____ Date/Time: 4/27/2002 1405
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: RICK MERKES / _____ Date/Time: 4-27-02 2030
Name (Print) / Signature

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

OPERABILITY DETERMINATION

___ CR _____ - _____

REV _____

PART II CORRECTIVE ACTION PLAN, SCHEDULE AND JUSTIFICATION
This plan should be developed as a part of the EAC process. (30 days to complete)

1. For those Operable But Degraded or Nonconforming items, what action(s) need to be done to restore the condition to its "fully operable" or "fully qualified" status?

   - Also consider any compensatory measures in place and what needs to be done for their removal.

2. When should the action(s) listed in question 1 be performed? This schedule represents the earliest available opportunity to perform the corrective actions, allowing reasonable time for planning, scheduling, design, procurement, etc.

3. Please provide justification for this schedule based on:

   - the amount of time required for design, review, and approval of the corrective action,
   - procurement for replacement or repair,
   - availability of specialized equipment to perform the repair,
   - the need to be in hot or cold shutdown to implement the corrective action,
   - or other factors that constrain the corrective action schedule.

Prepared by: _____ Date/Time: _____
Name (Print) / Signature

Engineering Manager Approval: _____ Date/Time: _____
Name (Print) / Signature

NMC
Committed to Nuclear Excellence

INTERNAL
CORRESPONDENCE

To: Mark Reddemann

From: James H. Hanna

Date: January 8, 2002

Subject: AF SYSTEM CONTINUED OPERABILITY (Rev 1)

Copy To: Rick Mende Fred Cayia Tom Taylor Lori Armstrong Stew Yuen

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The following explains the assessment of the AF system as being fully operable and capable of meeting its design requirements relative to system descriptions included in the FSAR. The PBNP FSAR describes the use and function of the recirculation flow provided for the auxiliary feed water pumps, including the design features, equipment and system performance. Section 10.2.2 "System Design and Operation" and 10.2.3 "System Evaluation" contain these references and section titles can cause confusion with the "Design Basis" for the system as defined by 10 CFR 50.2. These FSAR sections are attached with references to recirculation highlighted.

This review does not incorporate the affects of 10 CFR 50 Appendix R events relative to equipment performance. An Appendix R assessment is being separately conducted under CR 01-3648.

Using NRC Inspection Manual Procedure Part 9900, "Operability," as a template for review of the Auxiliary Feed pump recirculation line issue and its attendant operability assessment by the station, the following is determined.

A. Licensing basis:

1. 10 CFR Parts 2, 19, 20, 21, 30, 40, 50, 51, 55, 72, 73, 100.
2. Orders
3. License conditions
4. License exemptions
5. Technical Specifications
6. Commitments
7. Plant-specific design basis information in current FSAR.

With the exception of the FSAR and Technical Specification system descriptions, no specific information regarding the performance of the AF system relative to recirculation has been found in any of the above.

B. Design basis, Defined by 10 CFR 50.2:

Design bases means that information which identifies the specific functions to be performed by a structure, system, or component of a facility, and the specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be (1) restraints derived from generally accepted "state of the art" practices for achieving functional goals, or (2) requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals.

The "specific functions" to be performed by the Auxiliary Feed system are identified in the FSAR section 10.2.1 "Design Basis." These functions are quoted here for reference:

1. The AF system shall automatically start and deliver adequate AF system flow to maintain adequate steam generator levels during accidents which may result in main steam safety valve opening. Such accidents include; LOSS OF NORMAL FEEDWATER (LONF), FSAR Chapter 14.1.10, and LOSS OF ALL AC POWER TO THE STATION AUXILIARIES (LOAC), FSAR chapter 14.1.11, events, LONF and LOAC are time-sensitive to AF system start-up.
2. The AF system shall automatically start and deliver sufficient AF system flow to maintain adequate steam generator levels during accidents which require rapid reactor coolant system cooldown to achieve the cold shutdown condition within the limits of the analysis. Such accidents include; STEAM GENERATOR TUBE RUPTURE (SGTR), FSAR Chapter 14.2.4, and MAIN STEAM LINE BREAK (MSLB), FSAR Chapter 14.2.5.
3. The AF system shall be capable of isolating the AF steam and feedwater supply lines from the ruptured steam generator following a SGTR event.
4. In the event of a station blackout (prolonged loss of offsite and onsite AC power) affecting both units, the AF system shall be capable of automatically supplying sufficient feedwater to remove decay heat from both units without any reliance on AC power for one hour.
5. In the event of plant fires, including those requiring 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. The AF system shall support achieving cold shutdown within 72 hours.

C. Degraded Condition: A condition of an SSC in which there has been any loss of quality or functional capability. Since the postulated failure can only occur after an operator has intervened to alter the "automatic" operation of the AF system, this issue is clearly associated only with operator actions subsequent to accident initiation and no loss of quality nor loss of

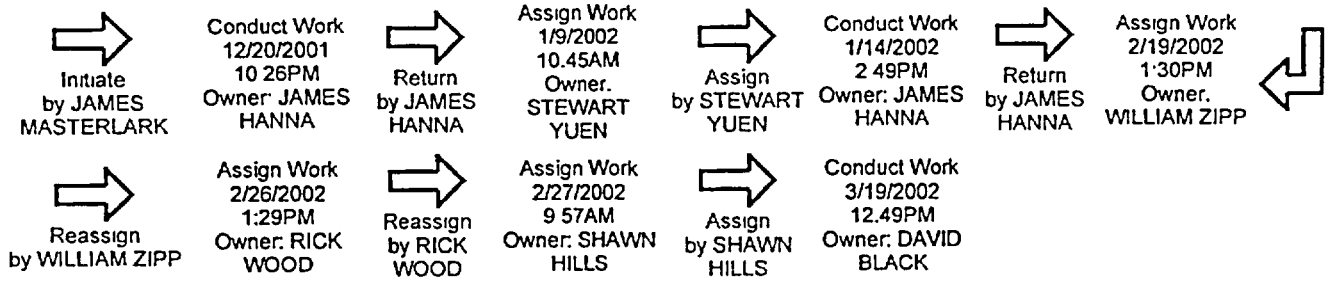
functional capability exists. The AF system will function today, as it would have in the past, to perform the functions listed in the design basis.

D. Nonconforming Condition: A condition of an SSC in which there is a failure to meet requirements or licensee commitments. Some examples of nonconforming conditions include the following.

1. There is a failure to conform to one or more applicable codes or standards specified in the FSAR. Although piping and systems are covered by codes and standards, the system feature of AF recirculation flow is not governed by any codes or standards included in the CLB.
2. As-built equipment, or as-modified equipment, does not meet FSAR design requirements. The PBNP GDCs and Design Basis (as explained in section B) represent "FSAR design requirements." Again, absent operator action, the function to automatically provide AF water to support the Design Basis is unaffected by this issue.
3. Operating experience or engineering reviews demonstrate a design inadequacy. Design of the AF system is adequate to fulfill the requirements of the Design Basis as demonstrated through testing and surveillances. Since the SSC's are capable of achieving these requirements, no loss nor degradation of function is present. Design adequacy is ensured by the system performing those functions for which it was designed and therefore no design inadequacy exists. The design function of the recirculation valves is clearly to isolate recirculation flow to ensure adequate forward flow is provided to cool steam generators. System design did not include features to protect equipment from all possible subsequent manual operator actions once operators took control of the equipment. Additionally, Probabilistic Risk Assessment (PRA) analysis (a tool not available when the system was designed) has identified a scenario which results in an increase in core damage frequency unacceptable by today's standards. This, however does not suggest nor confirm that the original design was inadequate.
4. Documentation required by NRC requirements such as 10 CFR 50.49 is not available or deficient. Documentation is not relevant to this issue.

E. Full Qualification: Full qualification constitutes conforming to all aspects of the current licensing basis, including codes and standards, design criteria, and commitments. As demonstrated in the preceding paragraphs, no deviation from stated requirements exists as a result of the discovery of the need for procedural enhancements to ensure operators will take actions consistent with plant conditions to protect the AF pumps in exceptional circumstances.

State Change History



Section 1

Activity Request Id: CA002593

Activity Type: Corrective Action **Submit Date:** 12/4/2001 1:00:00 AM

Site/Unit: Point Beach - Common

Activity Requested: REQUIRED ACTION: Perform OD CR 01-3595, Part II (12/31/01 due date). \\DESCRIPTION: \While performing an update to the Auxiliary Feed Water (AFW) System model\\in the PRA, a procedural shortcoming was identified in AOP 5B with regards to the availability of the minimum recirculation valve with the loss of instrument air. This issue was documented in CR 01-2278 with a recommendation to upgrade the procedure. Upon further review of this issue with PRA engineers, Operations, and Design Engineering, it was discovered that this issue has further reaching affects as documented below.\\Instrument air (IA) can be lost primarily by two failure mechanisms. The first, and most likely, is a loss of off-site power where the IA and Service Air (SA) compressors are stripped from the bus and not automatically re-loaded. The second less likely scenario is a random loss of the instrument air system due to equipment failure without potential for short term recovery. When IA is lost, the minimum flow recirculation valves for AFW fail closed.\\During these two transients, the AFW pumps will start injecting into the steam generators. Early in the EOPs, the operator is directed to control flow to the steam generators to maintain desired level. This may include shutting off flow to one or both steam generators if level is above the desired band. If flow from any auxiliary feed pump is reduced too low (as would occur if the auxiliary feed regulating valves are closed) without functional recirculation valves, the pump will fail in a very short period of time. This common mode of failure (common loss of instrument air and common response to high steam generator level) could result in simultaneous failure of all AFW pumps.\\PRA has estimated the risk associated with this issue. The total risk increase due to both the loss of off-site power and loss of instrument air contribution is approximately a factor of 4 times higher than our assumed base risk with an overall increase in the area of 2E-4 CDF per year (base risk is around 5E-5 CDF per year).\\WHY DID EVENT/ISSUE OCCUR? Current design of plant - deficiency not previously recognized.\\RECOMMENDATIONS: 1) Engineering needs to further evaluate and determine long term corrective action.\\2) PRA needs to evaluate and provide guidance for short term Maintenance Rule risk monitoring until new model is implemented.

CATPR: N **Initiator:** YUEN, STEWART

Initiator Department: EEV Engineering Equipment Valve Performance PB **Responsible Group Code:** EPN Engineering Programs Nuclear Safety Analysis PB

Responsible Department: Engineering **Activity Supervisor:** SHAWN HILLS

Activity Performer: DAVID BLACK

Section 2

Priority: 2 **Due Date:** 4/10/2002

Mode Change Restraint: (None) **Management Exception From PI?:** N

QA/Nuclear Oversight?: N **Licensing Services Follow-up?:** N

NRC Commitment?: N NRC Commitment Date:

Section 3

Activity Completed: 2/19/2002 1:29PM - JAMES HANNA:
Revision to OD and White paper supporting PBNP position regarding Auxiliary Feed System operability has been completed (January) and is with engineering management (Armstrong) awaiting approval. Current action to allow revision of OD to fully operable is review and approval of 50.59 evaluation for operations procedure changes (Black). Please transfer this item to Dave Black with the same due date. Specific action should be to inform engineering management that revision to OD may proceed.

3/19/2002 12:49PM - SHAWN HILLS:
Extended due date to 4/10/2002.

Section 4

QA Supervisor: (None) **Licensing Supervisor:** (None)

Notes/Comments

Request for extension by JAMES HANNA (12/31/2001 9:01:04 AM)
12/17/10 a request for extension of this action item was submitted. As of 12\31\01, no decision on the extension request has been communicated.

OD 01-3595 revision by JAMES HANNA (12/31/2001 9:39.07 AM)
On 12/20/01 a second revision to OD 01-3595 was submitted to engineering management with a white paper detailing the basis for continued AF system operability. This revision would obviate the need for a "part II" since a determination of fully operable was reached. The revision has not yet been approved and is awaiting further management review.

Note created during 'Return' transition by JAMES HANNA (1/9/2002 10:45:36 AM)
Please extend this item until 3/1/2002 due to exceptional reviews required to disposition the Operability Determination for this issue.

Note created during 'Return' transition by JAMES HANNA (2/19/2002 1:30:56 PM)
Please transfer this item to Dave Black for action. See 2/19/02 update.

Attachments and Parent/Child Links

Linked From Parent 'CAP001415'

Extension request

Change History

2/27/2002 9:57AM by RICK WOOD
3/19/2002 12 49PM by SHAWN HILLS
Due Date Changed From 3/1/2002 To 4/10/2002
Activity Completed Changed From '[Original Text]' To '[Appended.] 3/19/2002 12:49PM - SHAWN HILLS: Extended due date to 4/10/2002.'
State Changed From Assign Work To Conduct Work Via Transition. Assign
Owner Changed From SHAWN HILLS To DAVID BLACK
Assigned Date Changed From 1/14/2002 To 3/19/2002
Last Modified Date Changed From 2/27/2002 9.57:08 AM To 3/19/2002 12:49.42 PM
Last Modifier Changed From RICK WOOD To SHAWN HILLS
Last State Change Date Changed From 2/19/2002 1:30:56 PM To 3/19/2002 12:49 42 PM
Last State Changer Changed From JAMES HANNA To SHAWN HILLS

****
* Trkid: CR 01-3595 *
* Action Number: 3 *
****

Responsible Person: JAMES HANNA
Urgency: NOT DUE / IN CLOSEOUT
Work Priority: 2

LEVEL B

Activity Pending is: ACTION VERIFICATION

----------TITLE AND TASK DESCRIPTION----------

Probabilistic Risk Assessment PRA For Auxiliary Feedwater System AFW

REQUIRED ACTION: Perform OD CR 01-3595, Part II (12/31/01 due date).

DESCRIPTION:
While performing an update to the Auxiliary Feed Water (AFW) System model in the PRA, a procedural shortcoming was identified in AOP 5B with regards to the availability of the minimum recirculation valve with the loss of instrument air. This issue was documented in CR 01-2278 with a recommendation to upgrade the procedure. Upon further review of this issue with PRA engineers, Operations, and Design Engineering, it was discovered that this issue has further reaching affects as documented below.

Instrument air (IA) can be lost primarily by two failure mechanisms. The first, and most likely, is a loss of off-site power where the IA and Service Air (SA) compressors are stripped from the bus and not automatically re-loaded. The second less likely scenario is a random loss of the instrument air system due to equipment failure without potential for short term recovery. When IA is lost, the minimum flow recirculation valves for AFW fail closed.

During these two transients, the AFW pumps will start injecting into the steam generators. Early in the EOPs, the operator is directed to control flow to the steam generators to maintain desired level. This may include shutting off flow to one or both steam generators if level is above the desired band. If flow from any auxiliary feed pump is reduced too low (as would occur if the auxiliary feed regulating valves are closed) without functional recirculation valves, the pump will fail in a very short period of time. This common mode of failure (common loss of instrument air and common response to high steam generator level) could result in simultaneous failure of all AFW pumps.

PRA has estimated the risk associated with this issue. The total risk increase due to both the loss of off-site power and loss of instrument air contribution is approximately a factor of 4 times higher than our assumed base risk with an overall increase in the area of 2E-4 CDF per year (base risk is around 5E-5 CDF per year).

WHY DID EVENT/ISSUE OCCUR? Current design of plant - deficiency not previously recognized.

RECOMMENDATIONS: 1) Engineering needs to further evaluate and determine long term corrective action.

2) PRA needs to evaluate and provide guidance for short term Maintenance Rule risk monitoring until new model is implemented.

----------DATES----------

Source Record: 11/29/01	******* Evaluation *********	****** Correction ******
Commitment:	Eval Due:	Corr Act Due: 12/31/01
Action Create: 12/04/01	Orig Eval Due:	Orig CA Due: 12/31/01
Action Closed:	Eval Done:	Corr Act Done:01/21/02

----------PEOPLE----------

Responsible for Overall Action:	NMS	JAMES HANNA
Responsible for Current Pending Activity:	SEP	RICHARD MENDE
Issue Manager:		RICHARD MENDE
Initiator:		JAMES MASTERLARK
Punchlist Administrator:		JULIE KREIL

----------UPDATE----------

(12/10/01 TCK) Issued to Group: SEP
The issue identified required an 8 hour notification under 10 CFR 50.72. Immediate corrective actions involved Operator shift briefings, changes to EOPs, etc. On the day following the CR initiation, Operations requested an Operability Determination be provided. The CR identified the condition as Operable (based on implemented corrective actions) but non-conforming

to the FSAR description of the valves' function.

Pursuant to the notification, an NRC inspection team was dispatched to the site and a special inspection of the issue conducted during the week of 12/3/01. The exit for the inspection will be held on 12/13/01.

Management has directed a root cause investigation be performed, with R. Flessner designated as the team lead. This action item is being transferred to SEP for the root cause evaluation. Note that an emergent modification has been requested and is in development to provide safety related nitrogen or other motive force to the subject AOVs. It is anticipated that this modification will have been issued and possibly installed by the time the root cause investigation has been completed. This will permit for proper close-out of the issue.

(12/10/01 TCK) Issued to Group: NMS
The OD has been revised, and a final closure as "fully operable" is expected shortly. J. Hanna will be issuing the revision. Upon closure of the OD as fully operable, this action item may be closed with no additional action required. Item is being transferred to the group responsible for issuance of the pending revision.

(12/13/01 SJY) Received Action into Group: NMS
Responsible Person: JHH:JAMES HANNA Due Date: 12/31/2001

(20011213 WE7222 SJY) Set Work Priority to 2.

(01/17/02 JHH) Passed to STEWART YUEN for acceptance of work.

(01/21/02 SJY) Passed to RICHARD MENDE for Verification.
This item transferred to new corrective action system. Reference CA 2593

----------REFERENCES----------

CR 01-2278 RCE 01-069
GOOD CATCH

-AISN$TA1-x----------MISCELLANEOUS----------

Originating Agency: System: AF
NRC Open Item Number: NRC Status:
Related Outages:
Plant Conditions: Not Required for Startup
Operability: OPERABLE
Root Cause Evaluation: N Restart Issue: N
Person Hours: Original Estimate =
Current Estimate =
Actual Hours =

CONDITION REPORTS (CRs)
CR 01-3595

STATUS: OPEN UNIT: 0 SYSTEM: AF INITIATED: 11/29/01 CLOSED:
MSS #: ADMINISTRATOR: JULIE KREIL
INITIATOR: JAMES MASTERLARK ISSUE MANAGER: RICHARD MENDE
INITIATOR GROUP: NSA
NUMBER OF OPEN ACTIONS: 4 NUMBER OF CLOSED ACTIONS: 0

Probabilistic Risk Assessment PRA For Auxiliary Feedwater System AFW

DESCRIPTION:
While performing an update to the Auxiliary Feed Water (AFW) System model in the PRA, a procedural shortcoming was identified in AOP 5B with regards to the availability of the minimum recirculation valve with the loss of instrument air. This issue was documented in CR 01-2278 with a recommendation to upgrade the procedure. Upon further review of this issue with PRA engineers, Operations, and Design Engineering, it was discovered that this issue has further reaching affects as documented below.

Instrument air (IA) can be lost primarily by two failure mechanisms. The first, and most likely, is a loss of off-site power where the IA and Service Air (SA) compressors are stripped from the bus and not automatically re-loaded. The second less likely scenario is a random loss of the instrument air system due to equipment failure without potential for short term recovery. When IA is lost, the minimum flow recirculation valves for AFW fail closed.

During these two transients, the AFW pumps will start injecting into the steam generators. Early in the EOPs, the operator is directed to control flow to the steam generators to maintain desired level. This may include shutting off flow to one or both steam generators if level is above the desired band. If flow from any auxiliary feed pump is reduced too low (as would occur if the auxiliary feed regulating valves are closed) without functional recirculation valves, the pump will fail in a very short period of time. This common mode of failure (common loss of instrument air and common response to high steam generator level) could result in simultaneous failure of all AFW pumps.

PRA has estimated the risk associated with this issue. The total risk increase due to both the loss of off-site power and loss of instrument air contribution is approximately a factor of 4 times higher than our assumed base risk with an overall increase in the area of 2E-4 CDF per year (base risk is around 5E-5 CDF per year).

WHY DID EVENT/ISSUE OCCUR? Current design of plant - deficiency not previously recognized.

SIGNIFICANCE/REQUIREMENT NOT MET: See description. Potential common failure mode for all auxiliary feed pumps under certain initiating events.

CORRECTIVE ACTIONS TAKEN: Operations has been notified and action is being taken to brief operation crews and provide temporary instruction for the operation of the AFW discharge valves.

RECOMMENDATIONS: 1) Engineering needs to further evaluate and determine long term corrective action.

2) PRA needs to evaluate and provide guidance for short term Maintenance Rule risk monitoring until new model is implemented.

STATUS UPDATE:
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(20011204 PB2171 JMK1) Operability Determination (OD) Part I, Revision 0, of CR 01-3595 was approved on 11/30/01. Operable But Degraded - or Operable But Nonconforming - meets the minimum required level of performances, compensatory measures ARE required.

Operability Determination (OD) Part I, Revision 1 of CR 01-3595 was approved on 12/01/01. Operable But Degraded - or Operable But Nonconforming - meets the minimum required level of performances, compensatory measures ARE required.

SCREENED BY : PATRICK MATSON DATE: 11/29/01
REGULATORY REPORTABLE.....(Y/N): Y TS VIOLATION.....(Y/N): N
10 CFR 21.....(Y/N): N TS LCO ENTRY .....(Y/N): N
OPERABILITY IMPACT PER TS.(Y/N): N ACTION .....(A N P R W): R

MSS REVIEW REQUIRED .....(Y/N): N
OPERABILITY DETERMINATION.(Y/N): Y
SIGNIFICANCE .....(A B C D): B
COMMITMENT.....(Y/N): N

SUPPORTING DETERMINATIONS:
Operability Status: Operable
Operability Basis: AFW system has passed all required testing and is operable. An OD has been requested by plant staff.

SCREENER COMMENTS: Temp info tags will be placed at appropriate locations on the control boards to address this problem. This is only a short term fix.
Notification to NRC made at 1705 CST.

REFERENCES:
CR 01-2278 RCE 01-069
GOOD CATCH

ACTIONS	PRI	ACTION STATUS	RESPONSIBLE PERSON	DUE DATE
1	2	EVALUATION OVERDUE	RICHARD FLESSNER	01/10/02
2	3	ACTION VERIFICATION	RICK WOOD	12/28/01
3	2	ACTION VERIFICATION	JAMES HANNA	12/31/01
4	1	ACTION VERIFICATION	CHUCK KRAUSE	01/29/02