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

September 21, 1979

Docket Nos.: 50-266
50-301

Mr. Sol Burstein
Executive Vice-President
Wisconsin Electric Power Company
231 West Michigan Street
Milwaukee, Wisconsin 53201

Dear Mr. Burstein:

SUBJECT: NRC REQUIREMENTS FOR AUXILIARY FEEDWATER SYSTEMS AT POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

The purpose of this letter is to advise you of our requirements for the auxiliary feedwater systems at the subject facility. These requirements were identified during the course of the NRR Bulletins and Orders Task Force review of operating reactors in light of the accident at Three Mile Island, Unit 2.

Enclosure 1 to this letter identifies each of the requirements applicable to the subject facility. These requirements are of two types, (1) generic requirements applicable to most Westinghouse-designed operating plants, and (2) plant-specific requirements applicable only to the subject facility. Enclosure 2 contains a generic request for additional information regarding auxiliary feedwater system flow requirements.

The designs and procedures of the subject facility should be evaluated against the applicable requirements specified in Enclosure 1 to determine the degree to which the facility currently conforms to these requirements. The results of this evaluation and an associated schedule and commitment for implementation of required changes or actions should be provided for NRC staff review within thirty days of receipt of this letter. Also, this schedule should indicate your date for submittal of information such as design changes, procedure changes or Technical Specification changes to be provided for staff review. You may also provide your response to the items in Enclosure 2 at that time.

In addition to the requirements identified in this letter, other requirements which may be applicable to the subject facility are expected to be generated by the Bulletins and Orders Task Force. Such requirements are those resulting from our review of the loss-of-feedwater event and the small break loss-of-coolant accident as described in the Westinghouse report WCAP-9600, "Report on Small

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Break Accidents for Westinghouse NSSS System." Our specific concerns include systems reliability (other than the auxiliary feedwater system), analyses, guidelines and procedures for operators, and operator training.

We plan to identify, in separate correspondence, the requirements resulting from the additional items from the Bulletins and Orders Task Force review.

Sincerely,

Darrell G. Eisenhut, Acting Director
Division of Operating Reactors
Office of Nuclear Reactor Regulation

Enclosures:
As stated

cc: w/enclosure
See next page

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ENCLOSURE 1

X.11 (W) POINT BEACH 1 AND 2

AUXILIARY FEEDWATER SYSTEM (AFWS)

X.11.1 System Description

X.11.1.1 Configuration, Overall Design

A simplified flow diagram of Point Beach 1 and 2 AFWS is shown in Figure 1. The automatically initiated auxiliary feedwater (AFW) system for each Point Beach Unit is partially shared between units 1 and 2 to supply AFW to both steam generators of each unit. Each AFW system uses a turbine drive pump and a motor driven pump. The turbine driven pump of one unit feeds both steam generators of that unit only. The motor driven pump of each unit feeds one steam generator in each unit and therefore is shared between units. The turbine driven pumps supply AFW to the main feedwater piping inside containment through a motor operated valve for each steam generator of their respective units. The motor operated valves (MOV 1A and 2A for Unit 1, MOV 1B and 2B for Unit 2 on Figure 1) are normally opened to a throttled position to supply design flow to each steam generator. On loss of power these valves fail as-is.

Each of the two motor driven pumps supplies AFW to one steam generator of each unit through individual motor operated isolation valves which are normally open and fail as-is on loss of power. (MOV 3A and 3B from one pump and MOV 4A and 4B from the other pump). A pressure control valve (PCV-1 for Unit 1, PCV-2 for Unit 2) at the discharge

of each pump controls flow to two steam generators (one generator per unit) by maintaining a constant pressure at the pump discharge. The set point of this controlled pressure determines flow to the steam generators and can be varied by the control room operator. The PCV's are air operated and fail open upon loss of air.

All four AFW pumps normally take suction from two non-seismic Category I condensate storage tanks (45,000 gallons capacity each) through manually operated locked open isolation valves. The condensate storage tanks are normally lined up in parallel to the common suction header of the AFW pumps.

The minimum total capacity of the condensate storage tanks (by Technical Specifications) is 10,000 gallons per operating unit. The total capacity (20,000 gallons) will allow at least 25 minutes of supply with both turbine drive AFW pumps running (400 gpm per turbine-driven pump) or 50 minutes supply with both motor-driven pumps running (200 gpm per motor driven pump). The service water system serves as the seismic Category I source of water to the AFWS and is capable of unlimited supply. The service water system (SWS) connects directly to the suction of each AFW pump down-stream of the suction check valves and is therefore unaffected by malfunctions in the condensate tank supply portion of the AFW system. SWS supply is initiated in the control room by opening a 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.

Since all valves in the flow path to the steam generators are normally open and fail as-is (with exception of PCV-1 and 2 which fail open) a loss of A-C or D-C power does not require valve manipulation. The motor operated steam valves at the inlet to the turbines (MS-1A and 2A for Unit 1, MS-1B and 2B for Unit 2) are D-C motor operated valves and will automatically open in the event of a loss of all A-C power.

In the event of an unisolable main steam or feedwater line break coincident with a worst case single active failure, operator action within the control room will isolate AFW flow to the affected steam generator and assure flow to the unaffected steam generator. The licensee estimates >30 minutes to boil dry.

A break anywhere in the auxiliary feedwater system discharge piping would not prevent automatic AFW flow to at least one steam generator on demand. A single active failure coincident with a break could disable automatic AFW to both steam generators, depending on break location. In either case, breaks could be isolated by operator action within the control room.

X.11.1.2 Component Design Classification

All pumps, valves, piping, instrumentation and controls associated with the auxiliary feedwater system (except Condensate Storage Tanks) are designed safety Class I which includes seismic Category I requirements.

The condensate storage tank and associated instrumentation are not designed to safety grade requirements. The piping from the tank to the auxiliary feedwater system is classified as safety class I which includes seismic Category 1 requirements.

X.11.1.3 Power Sources

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. Steam generator water level control and the automatic initiation system are designed as a safety related system, including seismic Category I.

Each motor driven pump and associated instrumentation and controls are powered by a separate diesel-generator, such that a failure of one diesel generator will only disable one motor driven train.

The turbine driven pump for each unit receives steam from both steam generators of its respective unit through parallel d-c motor operated isolation valves. The parallel valves are powered from separate D-C buses such that a loss of one d-c system will not prevent operation of either turbine driven pump.

X.11.1.4 Instrumentation and Controls

X.11.1.4.1 Controls

All controls for the active components of the auxiliary feedwater system can be operated from the control room. Normally steam generator

level is controlled in the control room by adjusting the pressure set point of the pressure control valves at the discharge of each motor driven pump. If it is necessary to control turbine pump flow for level control, the motor operated valves in the discharge lines from the turbine driven pump each steam generator can be throttled from the control room.

Each control actuator in the control room is located in a basic system layout (MIMIC Bus) to help identify the control switch function in addition to the identifying name plate.

X.11.1.4.2 Information Available to the Operator

I. Alarms

a) Hi/Lo Steam Generator Level

b) Low Level - Condensate Storage Tank

c) Service Water System Header Pressure Low

II. Indication

a) Steam Generator Level

b) Condensate Storage Tank Level

c) AFW pump discharge pressure

d) Service Water Header pressure

e) Valve Position Indication - All Active Valves

f) Pump Running Lights - Motor Drive

g) Pump Breaker Trouble Light - (Did Not Close on Demand)

h) Pressure Set Point - Pressure Control Valve

All valve position indicators are located with their respective controls on the "MIMIC Board" such that the valves are readily identified.

X.11.1.4.3 AFW Initiating Signals

I. Turbine Pumps

a) Lo-Lo Level in both S/G's of its respective unit - automatic

b) Loss of both 4 KV busses (Supply reactor coolant Pumps) - automatic

c) Manual - From Control Room

II. Motor Driven Pumps

a) Lo-Lo Level in any one S/G of either unit - automatic

b) Trip of both Main Feed Pump - either unit - automatic

c) Safety Injection Signal - either unit - automatic

d) Manual - from Control Room

X.11.1.5 Testing

1) Valve position is verified monthly

2) Service Water System supply valves are cycled monthly

3) Operational tests of AFW pumps are performed monthly by verifying pump suction and discharge pressure (Tests are staggered)

4) Flow verification tests from condensate tanks to S/G's are performed at each refueling or whenever in cold shutdown (Not more frequently than quarterly)

5) Automatic initiation of the AFW system is verified during each refueling.

6) Control and initiating circuits are tested with each pump and valve test

7) Following maintenance on the system, an operational test is performed to bring the system back in service.

X.11.1.6 Technical Specifications

A. When the reactor coolant is heated above 350°F the reactor shall not be taken critical unless the following conditions are met:

1a. Two Unit Operation - Three of the four auxiliary feedwater pumps are operable.

1b. Single Unit Operation - Either the turbine driven pump associated with that unit together with one of the two motor driven pumps or both motor driven pumps must be operable.

2. A minimum of 10,000 gallons of water per operating unit in the condensate storage tanks and an unlimited water supply from the lake via either leg of the plant service water system.

3. System piping and valves required to function during accident conditions directly associated with the above components must be operable.

B. During power operation, the requirements are modified to allow the following components to be inoperable for a specified time.

If the system is not restored to meet the above requirements within the time period specified the appropriate reactor(s) shall be placed in the hot shutdown condition. If they are not satisfied within an additional 48 hours, the appropriate reactor(s) shall be cooled down to less than 350°F.

1. Two Unit Operation - One of the three operable auxiliary feedwater pumps may be out-of-service provided a pump is restored to operable status within 24 hours.
2. Single Unit Operation - One of the two operable auxiliary feedwater pumps may be out-of-service provided a pump is restored to operable status within 24 hours.

X.11.2 Reliability Evaluation

X.11.2.1 Dominant Failure Modes

The dominant failure modes are expressed for three transient situations and two operational configurations, single unit operation and double unit operation.

Limiting conditions for single unit operation are a single motor-driven pump and associated turbine driven pump operable or both motor driven pumps operable. Any one can be out of service for 24 hours.

Limiting conditions for double unit operation are three of four auxiliary feedwater pumps operable. Any one can be out of service for 24 hours.

LOFW with Only DC Power Available

Single Unit Operation

The dominant failure contributor is loss of both motor-driven pumps and subsequent failure of the turbine driven pump due to loss of service water (AC) cooling to steam turbine pump bearing oil.

Double Unit Operation

Same failure as single unit operation.

X.11.2.2 Interdependencies

The principal noted dependency is the design for AC cooling of the turbine driven pumps.

X.11.3 Recommendations for this Plant

The short-term recommendations (both generic, denoted by GS, and plant-specific) identified in this section represent actions to improve AFW system reliability that should be implemented by January 1, 1980, or as soon thereafter as is practicable. In general, they involve upgrading of Technical Specifications or establishing procedures to avoid or mitigate potential system or operator failures. The long-term (both generic, denoted by GL, and plant-specific) recommendations identified in this section involve system design evaluation and/or modifications to improve AFW system reliability and represent actions that should be implemented by January 1, 1981, or as soon thereafter as is practicable.

X.11.3.1 Short-Term

1. Recommendation GS-1 - The licensee should propose modifications to the Technical Specifications to limit the time that one AFW system pump and its associated flow train and essential instrumention can be inoperable. The outage time limit and subsequent action time should be as required in current Standard Technical Specifications; i.e., 72 hours and 12 hours, respectively.

2. Recommendation GS-2 - The licensee should lock open single valves or multiple valves in series in the AFW system pump suction piping and lock open other single valves or multiple valves in series that could interrupt all AFW flow. Monthly inspections should be performed to verify that these valves are locked and in the open position. These inspections should be proposed for incorporation into the surveillance requirements of the plant Technical Specifications. See Recommendation GL-2 for the longer-term resolution of this concern.

4. Recommendation GS-4 - Emergency procedures for transferring to alternate sources of AFW supply should be available to the plant operators. These procedures should include criteria to inform the operator when, and in what order, the transfer to alternate water sources should take place. The following cases should be covered by the procedures:

- The case in which the primary water supply is not initially available. The procedures for this case should include any operator actions required to protect the AFW system pumps against self-damage before water flow is initiated; and,

- The case in which the primary water supply is being depleted. The procedure for this case should provide for transfer to the alternate water sources prior to draining of the primary water supply.

Recommendation GS-5 - The as-built plant should be capable of providing the required AFW flow for at least two hours from one AFW pump train independent of any alternating current power source. If manual AFW system initiation or flow control is required following a complete loss of alternating current power, emergency procedures should be established for manually initiating and controlling the system under these conditions. Since the water for cooling of the lube oil for the turbine-driven pump bearings may be dependent on alternating current power, design or procedural changes shall be made to eliminate this dependency as soon as practicable. Until this is done, the emergency procedures should provide for an individual to be stationed at the turbine-driven pump in the event of the loss of all alternating current power to monitor pump bearing and/or lube oil temperatures. If necessary, this operator would operate the

turbine-driven pump in an on-off mode until alternating current power is restored. Adequate lighting powered by direct current power sources and communications at local stations should also be provided if manual initiation and control of the AFW system is needed. (See Recommendation GL-3 for the longer-term resolution of this concern.)

5. Recommendation GS-6 - The licensee should confirm flow path availability of an AFW system flow train that has been out of service to perform periodic testing or maintenance as follows:

   - Procedures should be implemented to require an operator to determine that the AFW system valves are properly aligned and a second operator to independently verify that the valves are properly aligned.
   - The licensee should propose Technical Specifications to assure that prior to plant startup following an extended cold shutdown, a flow test would be performed to verify the normal flow path from the primary AFW system water source to the steam generators. The flow test should be conducted with AFW system valves in their normal alignment.

6. Recommendation GS-7 - The licensee should verify that the automatic start AFW system signals and associated circuitry are safety-grade. If this cannot be verified, the AFW system automatic initiation system should be modified in the short-term to meet the functional requirements listed

below. For the longer term, the automatic initiation signals and circuit should be upgraded to meet safety-grade requirements as indicated in Recommendation GL-5.

- The design should provide for the automatic initiation of the auxiliary feedwater system flow.
- The automatic initiation signals and circuits should be designed so that a single failure will not result in the loss of auxiliary feedwater system function.
- Testability of the initiation signals and circuits shall be be a feature of the design.
- The initiation signals and circuits should be powered from the emergency buses.
- Manual capability to initiate the auxiliary feedwater system from the control room should be retained and should be implemented so that a single failure in the manual circuits will not result in the loss of system function.
- The alternating current motor-driven pumps and valves in the auxiliary feedwater system should be included in the automatic actuation (simultaneous and/or sequential) of the loads to the emergency buses.
- The automatic initiation signals and circuits shall be designed so that their failure will not result in the loss of manual capability to intiate the AFW system from the control room.

11.3.2 Additional Short-Term Recommendations

The following additional short-term recommendations resulted from the staff's Lessons Learned Task Force review and the Bulletins and Orders Task Force review of AFW systems at Babcock & Wilcox-designed operating plants subsequent to our review of the AFW system designs at W- and C-E-designed operating plants. They have not been examined for specific applicability to this facility.

1. Recommendation - 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.

2. Recommendation - The licensee should perform a 72-hour endurance test on all AFW system pumps, if such a test or continuous period of operation has not been accomplished to date. Following the 72-hour pump run, the pumps should be shut down and cooled down and then restarted and run for one hour. Test acceptance criteria should include demonstrating that the pumps remain within design limits with respect to bearing/bearing oil temperatures and vibration and that pump room ambient conditions

(temperature, humidity) do not exceed environmental qualification limits for safety-related equipment in the room.

3. Recommendation - The licensee should implement the following requirements as specified by Item 2.1.7.b on page A-32 of NUREG-0578:

"Safety-grade indication of auxiliary feedwater flow to each steam generator shall be provided in the control room.

The auxiliary feedwater flow instrument channels shall be powered from the emergency buses consistent with satisfying the emergency power diversity requirements for the auxiliary feedwater system set forth in Auxiliary Systems Branch Technical Position 10-1 of the Standard Review Plan, Section 10.4.9."

4. Recommendation - Licensees with plants which require local manual realignment of valves to conduct periodic tests on one AFW system train and which have only one remaining AFW train available for operation, should propose Technical Specifications to provide that a dedicated individual who is in communication with the control room be stationed at the manual valves. Upon instruction from the control room, this operator would re-align the valves in the AFW system train from the test mode to its operational alignment.

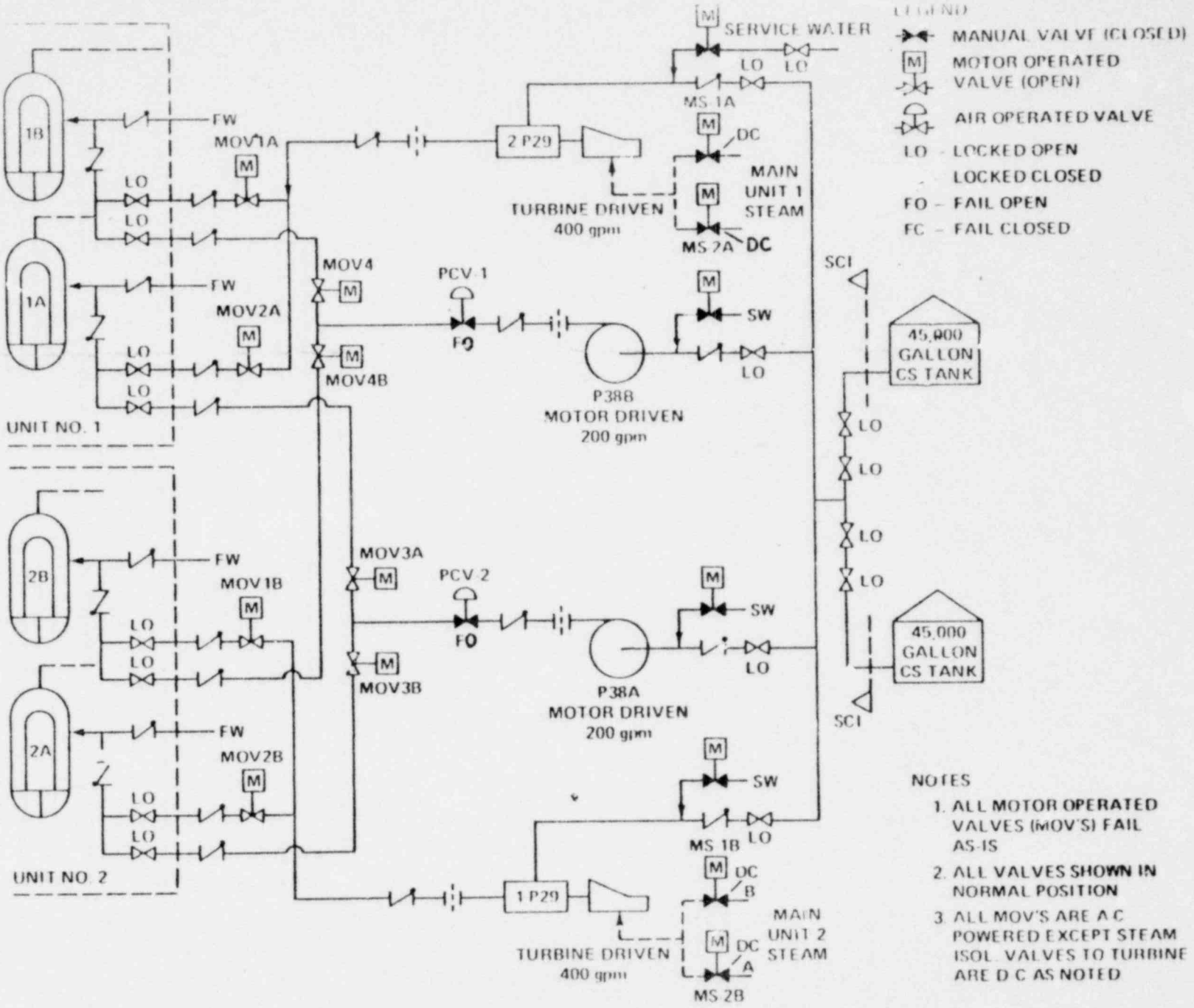
X.11.3.3 Long-Term

Long-term recommendations for improving the system are as follows:

1. Recommendation GL-3 - At least one AFW system pump and its associated flow path and essential instrumentation should automatically initiate AFW system flow and be capable of being operated independently of any alternating current power source for at least two hours. Conversion of direct current power to alternating current is acceptable.

2. Recommendation - 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. The time available before pump damage, the alarms and indications available to the control room operator, and the time necessary for assessing the problem and taking action should be considered in determining whether operator action can be relied on to prevent pump damage. Consideration should be given to providing pump protection by means such as automatic switchover of the pump suctions to the alternate safety-grade source of water, automatic pump trips on low suction pressure or upgrading the normal source of water to meet seismic Category I and tornado protection requirements.

3. Recommendation-GL-5 - The licensee should upgrade the AFW system automatic initiation signals and circuits to meet safety-grade requirements.



Auxiliary Feedwater System
Pt. Beach 1 & 2
Figure 1

ENCLOSURE 2

Basis for Auxiliary Feedwater
System Flow Requirements

As a result of recent staff reviews of operating plant Auxiliary Feedwater Systems (AFWS), the staff concludes that the design bases and criteria provided by licensees for establishing AFWS requirements for flow to the steam generator(s) to assure adequate removal of reactor decay heat are not well defined or documented.

We require that you provide the following AFWS flow design basis information as applicable to the design basis transients and accident conditions for your plant.

1. a. Identify the plant transient and accident conditions considered in establishing AFWS flow requirements, including the following events:

   1) Loss of Main Feed (LMFW)
   2) LMFW w/loss of offsite AC power
   3) LMFW w/loss of onsite and offsite AC power
   4) Plant cooldown
   5) Turbine trip with and without bypass
   6) Main steam isolation valve closure
   7) Main feed line break
   8) Main steam line break
   9) Small break LOCA
   10) Other transient or accident conditions not listed above

   b. Describe the plant protection acceptance criteria and corresponding technical bases used for each initiating event identified above. The acceptance criteria should address plant limits such as:

- Maximum RCS pressure (PORV or safety valve actuation)
- Fuel temperature or damage limits (DNB, PCT, maximum fuel central temperature)
- RCS cooling rate limit to avoid excessive coolant shrinkage
- Minimum steam generator level to assure sufficient steam generator heat transfer surface to remove decay heat and/or cool down the primary system.

2. Describe the analyses and assumptions and corresponding technical justification used with plant condition considered in 1.a. above including:

   a. Maximum reactor power (including instrument error allowance) at the time of the initiating transient or accident.

   b. Time delay from initiating event to reactor trip.

   c. Plant parameter(s) which initiates AFWS flow and time delay between initiating event and introduction of AFWS flow into steam generator(s).

   d. Minimum steam generator water level when initiating event occurs.

   e. Initial steam generator water inventory and depletion rate before and after AFWS flow commences - identify reactor decay heat rate used.

f. Maximum pressure at which steam is released from steam generator(s) and against which the AFW pump must develop sufficient head.

g. Minimum number of steam generators that must receive AFW flow; e.g. 1 out of 2?, 2 out of 4?

RC flow condition - continued operation of RC pumps or natural circulation.

i. Maximum AFW inlet temperature.

j. Following a postulated steam or feed line break, time delay assumed to isolate break and direct AFW flow to intact steam generator(s). AFW pump flow capacity allowance to accommodate the time delay and maintain minimum steam generator water level.

— Also identify credit taken for primary system heat removal due to blowdown.

k. Volume and maximum temperature of water in main feed lines between steam generator(s) and AFWS connection to main feed line.

l. Operating condition of steam generator normal blowdown following initiating event.

m. Primary and secondary system water and metal sensible heat used for cooldown and AFW flow sizing.

n. Time at hot standby and time to cooldown RCS to RHR system cut in temperature to size AFW water source inventory.

3. Verify that the AFW pumps in your plant will supply the necessary flow to the steam generator(s) as determined by items 1 and 2 above considering a single failure. Identify the margin in sizing the pump flow to allow for pump recirculation flow, seal leakage and pump wear.