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SUBJECT: Forwards application for amends to Licenses NPF-14 & NPF-22 re App R ESW mods.

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APR 14 1989

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SUSQUEHANNA STEAM ELECTRIC STATION
PROPOSED AMENDMENT 123 TO LICENSE NO.
NPF-14 AND PROPOSED AMENDMENT 70 TO
LICENSE NO. NPF-22:
APPENDIX R ESW MODIFICATIONS
PLA-3180 FILES A17-2/R41-2

Docket Nos. 50-387
and 50-388

Dear Dr. Butler:

The purpose of this letter is to propose changes to both the Susquehanna SES Unit 1 and Unit 2 Technical Specifications. These changes are as a result of modifications being done to Susquehanna SES in order to comply with 10CFR50, Appendix R.

DESCRIPTION OF CHANGE

The following changes, which are illustrated on the attached marked-up pages, are proposed for both Units 1 and 2:

- Table 3.8.4.2.1-1: Delete the ESW valves associated with each diesel generator. Also delete Footnote *.
- Table 3.8.4.2.2-1: Add the following ESW Loop A valves:

HV-01112E	ESW
HV-01122E	ESW

- Specification 4.8.2.1d: Revise the load profile for Channel "H" battery 0D595 as follows:

253 amperes for 60 seconds
75 amperes for the next 239 minutes

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SAFETY ANALYSIS

The proposed Technical Specification changes are a result of proposed modifications to the ESW System. These modifications are a result of our 10CFR50 Appendix R evaluation and other enhancements to the ESW system. A detailed description of the proposed modifications are included in Attachment 1.

The modifications involve removing the auto-loop transfer for each diesel generator's ESW valves, adding an auto closure to the loop A ESW valves for Diesel Generator E, and revision to the battery load profile for the Diesel Generator E 125V DC battery.

When the auto-loop transfer logic is removed, the Diesel Generator A through E ESW valves no longer have a safety-related function other than maintaining the flowpath integrity or an isolation boundary when the diesel generator is not aligned. Therefore, the thermal overload protection for these valves does not need to be continuously bypassed nor does it need the capability of being bypassed. The thermal overload protection bypass will be removed.

With the removal of the auto-loop transfer and the addition of the auto-closure, the Diesel Generator E loop A ESW valves' only safety-related function (other than flowpath integrity and isolation boundary) is to automatically close during a LOOP and/or LOCA condition when the diesel generator is not aligned but is being tested. This modification adds the auto-closure and automatic bypass of the thermal overload protection to the loop A ESW valves for Diesel Generator E. This modification is the same design as on the loop B valves which was part of the original Diesel Generator E design.

The battery load profile for the Diesel Generator E 125V DC battery is reduced due to the removal of the auto-loop transfer logic. This eliminated the load associated with the valves operating during the final minute of the profile.

NO SIGNIFICANT HAZARDS CONSIDERATIONS

I. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

No. Since once the auto-loop transfer logic is removed, the Diesel Generator A through D ESW valves no longer have a safety related function other than maintaining the flow path integrity or an isolation boundary when the diesel generator is not aligned. These valves will be open when diesel generators are aligned and will have no automatic actuation functions thus the thermal overload protection does not need to be continuously bypassed nor does it need the capability of being bypassed.

With the auto-loop transfer logic de-energized, the Diesel Generator "E" valves' only safety related function (other than flowpath integrity and isolation boundary) is to automatically close during a LOCA and/or LOOP condition when the diesel generator is not aligned but is being tested. The Diesel Generator "E" ESW loop B valves had this auto-close feature

incorporated in their design since their installation. The installation of the auto-closure for the loop A valves has the same basis as for the loop B valves. The Technical Specification changes for the loop B valves were approved in Amendment No. 61 for NPF-14 and Amendment No. 32 for NPF-22 dated 3/16/87.

FSAR Subsection 8.3.2.1.1.4 stated that the station batteries have sufficient capacity without the charger to independently supply the required loads for four hours. The Technical Specifications require that the batteries be surveilled to dummy loads which are greater than design loads. An assessment has been performed by our engineering department which verifies that the battery has adequate capacity to power the actual loads on the 125V DC system. The new load profile contained in the proposed amendment to the Technical Specifications envelop the actual loads.

II. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

No. Since the proposed changes do not change the function of the ESW system, they will not introduce a new or different kind of event. Any postulated accident resulting from these changes are bounded by previous analysis.

At stated in Part I, the batteries have sufficient capacity to power the actual battery loads thus enabling them to perform their intended function. Any postulated accident resulting from this change is bounded by previous analysis.

III. Does the proposed change involve a significant reduction in a margin of safety?

No. Since the diesel generator ESW valves no longer provide an automatic safety function, the removal of the continuous thermal overload protection bypass does not reduce a margin of safety. The addition of the auto-close and automatic thermal overload protection bypass for the Diesel Generator "E" Loop A ESW valves does not degrade the margin of safety of the ESW system or diesel generators. This change has already been approved for the Loop B ESW valves.

IEEE 485 requires that the related battery capacity include a margin for aging of the battery and the temperature of the batteries' environment at the beginning of battery life. This margin allows replacement of the battery when its capacity is decreased to 80% of its rated capacity (100% design load). Our engineering department has determined that with the revised reduced load profile the Class 1E 125V DC battery will supply its connected emergency loads with greater margins of safety at the battery electrolyte temperatures equal to or greater than 60°F and with 25% aging margins relative to load as recommended by IEEE-485-1983. With the decreased battery loads it can be concluded that the overall safety margin of the plant is not diminished.

IMPLEMENTATION

These proposed modifications are as a result of our 10CFR50, Appendix R reanalysis which has been committed to be completed by December 31, 1989. In order to meet this completion date and also in order not to create problems with coordination of systems being out of service, these modifications are scheduled to be completed after the 1989 Unit 1 Refueling Outage and before the 1989 Unit 2 Refueling Outage. Therefore PP&L requests that this proposed amendment be approved prior to July 1, 1989.

Any questions on this submittal should be directed to Mr. C. T. Coddington at (215) 770-7915.

Very truly yours,

H. W. Keiser

Attachment

cc: NRC Document Control Desk (original)
NRC Region I
Mr. F. I. Young, NRC Sr. Resident Inspector
Mr. M. C. Thadani, NRC Project Manager
Mr. T. M. Gerusky, PA DER

MODIFICATION TO ESW

The Emergency Service Water (ESW) System provides cooling water to the Emergency Diesel Generators which are required for Appendix R shutdown. 10CFR50 Appendix R Part III requires as a design basis that "during the postfire shutdown, the reactor coolant system process variables shall be maintained within those predicted for a loss of normal a.c. power..." The ESW System has Loop A and Loop B flow loops (see attached figure). Each loop supplies cooling water to the diesel coolers through separate inlet and outlet motor operated valves. Control of the valves is from Main Control Room Panel 0C653.

In addition to the diesel generators, the ESW System supplies cooling water to the Reactor Building Coolers, Reactor Building Room Coolers and the Control Structure Chillers which have separate A and B loop heat exchangers. However, there are not redundant diesel coolers for each loop, although either ESW loop can be aligned to the diesels. Loop A of ESW is normally aligned to those diesel coolers of the diesel generators which are aligned to the safety related 4.16 kv buses for standby automatic operation. In the event of low flow on Loop A or loss of an ESW pump, an auto-loop transfer logic in the ESW System automatically transfers the diesel coolers to the Loop B for the aligned diesel generators provided both Loop B pump breakers are closed. The transfer logic also closes the Loop B ESW valves of Diesel Generator E and trips the output breaker if it is not aligned but is being tested.

During a fire in the Main Control Room and other fire areas/zones, the control cables associated with either the ESW valve controls on 0C653 or the auto-loop transfer logic can be damaged and the operability of ESW is lost. The valves on both loops may also spuriously close due to a short in the control cables. Such spurious closure of the valves must be immediately corrected whenever the diesel engine is running for the Appendix R safe shutdown.

There are two prerequisites to performing this modification. First, the ESW check valves (0-11-033 through 0-11-040) at the inlets to Diesel Generators A through D must be replaced with more reliable valves. The Diesel Generator E check valves do not require replacement. Second, a test must be performed to verify that the new ESW valve alignment will not reduce ESW flows to safety-related coolers below their flow balance acceptance criteria (with the failure of one ESW pump). Both of these prerequisites must be completed prior to implementing the proposed modification.

The proposed action is to modify the controls of the ESW valves for the Emergency Diesel coolers as follows:

1. The valve controls on Main Control Room Panel 0C653 are removed. The valve position indicating lights are not removed so that the control room operator has valve position status for the aligned diesel generators. A fire in the control room can result in shorting the indicating lights which blows the control power fuse, but the valves will not change position once the modification is complete.

2. Local valve controls are added to the Engine Control Panel 0C521 in Diesel Generators A through D bays and the Building Auxiliary Services Panel 0C577E in the Diesel Generator E building. The local controls are used to close the ESW valves to isolate the diesel generator during maintenance and to open the valves when the diesel generator is aligned.

3. The auto-loop transfer logic is removed and both loops of the ESW System are normally aligned to the coolers of the four diesel generators in service.

4. Auto-closure logic is added to the Loop A valves of Diesel Generator E. The logic is the same as the existing Loop B logic which closes the valves and trips the output breaker if a LOOP and/or LOCA occur when the Diesel Generator E is not aligned but is being tested.

5. The continuous bypass of the thermal overload protection for the aligned diesel generators is deleted. Automatic bypass of the thermal overload protection is added to the Loop A ESW valves for Diesel Generator E when it is not aligned and is being tested.

Items No. 1, 2 and 3 are required to meet 10CFR50 Appendix R concerns about a fire damaging the Main Control Room switches or control cables associated with these valves. It is desirable to eliminate the auto-loop transfer logic for several other reasons which include:

a. The auto-loop transfer logic requires the operation of numerous subcomponents which results in an overall complexity that increases the probability for a single failure.

b. Due to the tolerances on ESW pump start timers, it is possible for the D pump to start prior to the C pump, on a LOCA signal. This, again, can lead to an undesired auto-loop transfer. The tolerances allow the pumps to start within the Technical Specification requirements.

c. There is no auto-loop transfer to Loop A from Loop B. Since an unwanted transfer and a single failure on Loop B of ESW is not within the design basis of the plant, this scenario could result in an unsafe condition.

d. The Loop A ESW pumps get far more run time than the Loop B pumps, since the diesels are normally aligned to the Loop A. This leads to uneven wear on the pumps.

e. This modification reduces the probability of a station blackout due to a diesel failure by a factor of two.

The continuous bypass of the thermal overload protection for the ESW system is only applicable to the aligned diesel generators. The bypass was from normally closed contacts of switches on panel 0C697 in the Main Control Room which are in parallel with the thermal overload protection. This modification deletes the normally closed parallel contacts from all of the ESW valve control circuits.

The automatic bypass of the thermal overload protection for the Diesel Generator E is a normal open contact of a relay which closes if a LOCA, LOOP or auto-loop transfer occurs with the Diesel Generator E not aligned. At present, only the Loop B valves have the automatic bypass. This modification deletes the auto-loop transfer input to the relay. In addition, the modification provides a similar automatic bypass scheme for the Diesel Generator E Loop A valves, so that the Loop A and/or Loop B ESW valves can be opened to the Diesel Generator E when it is not aligned, but is being tested.

At present, the breakers for the Loop A ESW valves of the unaligned diesel generator are required to be opened in accordance with plant procedures as required by Appendix R fire analysis. This modification deletes the requirement to open the breakers.

The modification provides new setpoints for the low flow alarms on Loop A and Loop B of the ESW System. The setpoint is based on previous testing performed and the flow checks required by the prerequisites.

It should be noted that there will no longer be the capability to open or shut the ESW valves from the control room. The control of the valves will now be local, in their respective diesel bays. This is not viewed as a problem. Currently, if an ESW leak occurs such that it would be desired to isolate a loop of ESW at one of the diesels, an alarm would come to the control room. If this were a flood detector alarm, an operator would need to go to the diesel bay in question in order to determine which ESW loop is leaking, or if the leak is from a demineralized water or fire protection line. Therefore, removing the remote valve control would not increase isolation time. If an ESW leak caused high process temperatures on a diesel, a trouble alarm would be received in the Main Control Room. Once again, an operator would need to go to the diesel bay in question, in order to determine what was causing the alarm condition. Therefore, removing the remote valve control would not increase isolation time. The local switches are located far enough away from ESW lines to alleviate any concerns about spray from an ESW leak damaging the local switches.

Since the proposed modification cross-ties both loops of ESW at the diesel, it must be demonstrated that a moderate energy leakage crack in ESW does not adversely effect flows in both ESW loops. A crack must be postulated in accordance with FSAR Section 3.6. Such leaks were analyzed and determined to be acceptable by PP&L.

ESW flow balances are performed with the diesel coolers aligned only to the loop being balanced. After the proposed modification, both ESW loops are aligned to the diesel coolers at the same time. This alignment will cause increased flow rates on all loop A ESW coolers. PP&L has analyzed this situation, and found it to be acceptable. Note that cooler throttle valves cannot be throttled back to reduce these higher flow rates because a single failure of control power to the pump motor breakers can cause both ESW pumps on one loop to fail. This would leave ESW in its current configuration with two pumps feeding one loop (including the diesel coolers) of ESW. Also, note

that with the current configuration, the loop of ESW which does not have the diesel coolers aligned has high heat exchanger tube velocities. Since there is no automatic throttling capability on ESW, flow balance throttling positions are set based on the worst-case which is to assure that minimum flow rates are met with the diesels valved in. Currently, some of the Reactor Building heat exchangers, on the ESW loop which is not valved into the diesels, will have tube velocities which are higher than normal. Leaving both ESW loops aligned to the diesel would decrease these tube velocities.

FSAR Section 3.6 (which references Branch Technical Position APCSB 3-1) addresses with pipe breaks and cracks. Per its definition, the ESW system would be considered moderate energy. As such, a circumferential pipe break does not need to be postulated. Only a moderate energy leakage crack must be considered.

The proposed action does not alter the system piping or the maximum system. pressure. Therefore, it does not in any way increase the probability of occurrence of a pipe crack. Likewise, it does not in any way increase the severity of the spray pattern from such a leak. Since both loops of ESW will be cross-tied at the diesels, it is necessary to consider whether a leakage crack can adversely affect both loops of ESW. PP&L investigated this issue and determined that a leakage crack does not cause a problem. In the event of a leakage crack upstream of the ESW check valves to the diesels, these check valves would prevent any reverse flow between loops. Existing flow balances demonstrate that one loop can adequately supply both the diesels and Reactor Building/Control Structure heat exchangers. Therefore, a leak upstream of the check valves would not adversely affect plant safety. In the event of a leakage crack between HV-01110 (HV-01112) and HV-01120 (HV-01122), the leak could not be isolated without taking that particular diesel out of service. This would be acceptable, since in accordance with FSAR Section 3.6 a LOOP does not need to be postulated along with the leakage crack (and therefore the diesels will not be required). PP&L determined that the amount of water leaking out does not have an adverse effect on other coolers in the system. This calculation also considered leaks downstream of the coolers and determined that a leak on one loop does not adversely affect flows to coolers on the other loop.

Per BTP APCSB 3-1, no other failure needs to be considered in the ESW system, along with a leakage crack. Therefore, failure of check valves 0-11-034 through 0-11-040, 0-11-513, or 0-11-514 do not need to be considered with a leak. However, the leakage rates determined by calculation indicates that even in the event of failure of one of these valves, the ESW system is still able to perform its design function in the event of a pipe leak, or in the event of any other single failure.

PP&L examined the proposed valve configuration and determined it to be acceptable, provided the diesel inlet check valves are re-installed and provided the previously mentioned flow check is performed.

FSAR Section 9.2.5.1 states that the ESW system has sufficient redundancy so that a single failure of any active component, assuming the loss of off-site power, cannot impair the capability of the system to perform its safety-related function.

FSAR Section 1.2.2.8.3 states that the ESW System is designed with sufficient redundancy so that no single active or passive system component failure can prevent it from achieving its safety objective.

Criterion 44 of 10CFR50 Appendix A states that cooling water systems which transfer heat from systems and components important to safety must accomplish their function, assuming a single failure, for either on-site or off-site electric power system operation.

The power and control to the ESW pumps is divisionalized such that loss of one channel of 125V DC control power to the ESW pump motor breakers or cable failures can result in both ESW pumps not starting on one loop. This is the worst-case single failure in the ESW system. The diesel inlet check valves will prevent flow from the operating loop into the failed loop, on the upstream side of the diesels. Also, the check valves at the ESW pump discharges on the failed loop provide a second barrier for this function. Although ESW will be cross-tied downstream of the diesels, the spray pond isolation valves prevent cross flow from the operating loop into the failed loop. For the postulated failure, the spray pond bypass valve on the failed loop would not automatically open since it opens after an ESW pump on its loop starts. RHRSW pumps on the failed ESW loop could be manually started and a spray pond valve could be opened for this reason.

Considering a loss of either A (or B) Diesel Generator, the effect is the same as mentioned in the paragraph above. There would be no power to open the spray pond bypass valve so one loop of ESW and RHRSW would be unavailable. As mentioned before, the spray pond valves prevent ESW loop cross-flow upstream of the diesels. Eventually the spray pond bypass valve could be manually opened on the failed loop and the C (or D) ESW and RHRSW pump started on this loop.

A single failure of one ESW pump would be no more severe than the case just mentioned.

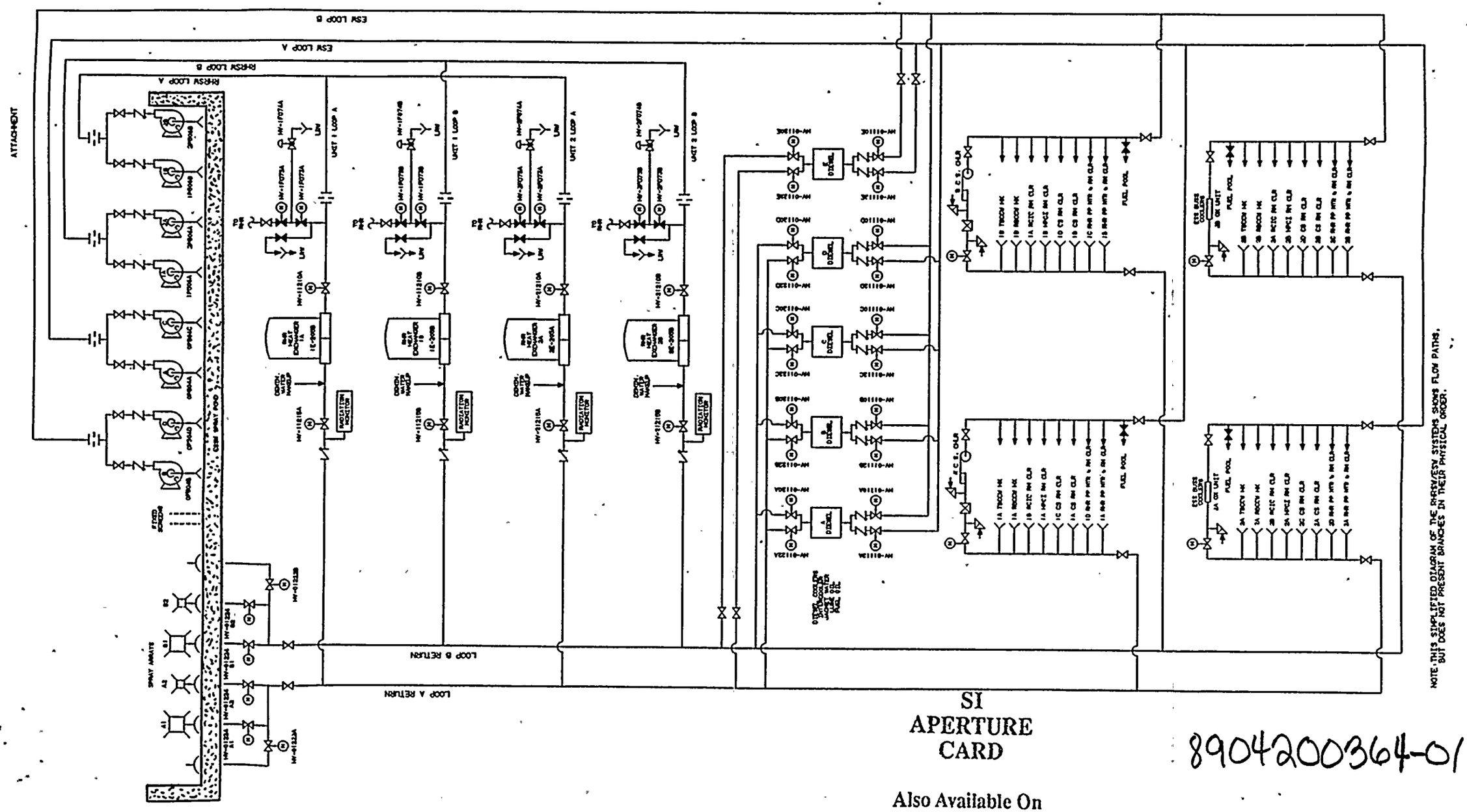
FSAR Sections 9.2.5.2 through 9.2.5.5 were reviewed, since they discuss the ESW System. This modification does not change anything mentioned in those sections.

FSAR Section 3.1.2.1.5 was reviewed to assure that this modification will not affect compliance with General Criterion 5 of 10CFR50 Appendix A. This modification does not cause any changes to this section.

FSAR Section 3.1.2.1.4 was reviewed to assure compliance with General Criterion 4 of 10CFR50 Appendix A. This FSAR section references Section 3.5 on missile protection criteria. Section 3.5.1 considers rotating component failure missiles and pressurized component failure missiles. This

modification does not alter the analyses in this section. There are three known catastrophic failures of Cooper nuclear service diesel's reciprocating parts. One involved failure of piston pin bolts, one involved failure of a connecting rod, and one involved failure of articulated rod bolts. These failures, as well as any other conceivable diesel missiles, would project radially from the diesel cylinders. Since the ESW piping in the diesel bays is located axillary away from the cylinders, an engine missile damaging the ESW pipe is not credible. However, it would be credible to have such a missile damage the engine control panel of one of the A through D engines. If this event caused a spurious valve position change on one or both ESW loops, it would not be a concern, since the diesel in question would already be inoperable. If an engine failure damaged the ESW valve handswitches, such that they could not close the valves, and there was a concurrent moderate energy leakage crack on that engine's ESW piping, the engine could either be isolated with its manual throttle valves, or the MOVs could be manually isolated (depending on where the leak was). Design ESW flows would need to be met, since neither a LOCA nor LOOP needs to be postulated concurrently with the ESW leak (per NRC BTP APCSB 3-1). The A through D diesel air start compressors are located such that a failure of their reciprocating parts could damage either the ESW pipe or the engine control panel. These failures are not considered credible for the following reasons: The compressors will not overspeed since they are powered by ac motors. The compressor reciprocating parts are relatively small, so their chance of failure is slight and their kinetic energy in the event of failure is relatively low. The parts would also need to fly a considerable distance in a non-radial direction to hit ESW piping.

A single-failure of a Spray Pond Bypass Valve (HV-01222A and B) to close must be considered for water hammer concerns. Prior to this modification, only part of one loop would have a potential to drain when one bypass valve failed to close (return from the control structure chiller). This modification does not make potential drain down worse in either particular loop, and does not prevent the ESW/RHRSW systems from fulfilling their design function. The control structure chiller lines and direct expansion (Dx) unit lines are the only piping which is high enough to drain. The single failure of a bypass valve will not normally allow these lines to drain, since there are isolation valves for these lines at relatively low elevations. The only time they could drain would be if a LOOP occurred while ESW was supplying cooling water to the control structure chiller or the Dx unit (such that these other isolation valves would not be closed). In this case the installed vacuum breakers would open and eliminate a waterhammer problem. Bechtel performed an ESW waterhammer analysis assuming these lines were drained, vacuum breakers were installed and the bypass valves were closed. The closed valve assumption was made to simplify the analysis. They found stresses under that situation to be acceptable. Clearly, the waterhammer impact is less if a bypass valve is opened, rather than closed, since the collapsing air pocket would be impacting a movable water column rather than a fixed water column. Therefore, the postulated scenario is acceptable.



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In response to additional concerns about the combined effects of the various changes being considered for the ESW System, PP&L performed a comprehensive review of the ESW System configuration and all available recent single failure studies on ESW. The results of the review concluded that the changing of all diesel cooler inlet and outlet isolation valves to be normally open, removing the automatic transfer logic for the aligned diesels and the installation of diesel cooler inlet check valves does not cause a degradation to plant safety. In fact, it is an improvement to plant safety. A review of proposed ESW System changes also established that the changes do not individually or aggregately create a problem from a single failure standpoint. All of the proposed changes either have no effect on system availability, or causes it to be improved.

PP&L had evaluated the risk significance of selected changes to the ESW System. Their results show that removing the auto loop transfer logic and changing the ESW System so that both loops supply the aligned diesels reduces the estimated frequency of core damage.

The Diesel Generator E motor operated valves require DC power and control from the 125V DC battery 0D595. The existing 4 hour load profile for battery surveillance testing is a three step profile with the final one minute (Step 3) representing a worst case condition of an auto-loop transfer occurring simultaneous with the continuous loads of Step 2. Since the proposed action deletes the auto-loop transfer logic, the 4 hour load profile is changed from a three step profile to a two step profile. This change is to eliminate the load associated with the valves operating during the final minute of the profile. The continuous load calculation for the auto-loop transfer logic and the valve controls was conservative. Therefore, the new two step 4 hour profile is slightly reduced to reflect changes in the continuous load.