VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

December 17, 1996

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Serial No. 96-599
NL&OS/GSS/ETS
Docket Nos. 50-338
50-339
License Nos. NPF-4
NPF-7

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
PROPOSED TEMPORARY TECHNICAL SPECIFICATIONS CHANGE
SERVICE WATER SYSTEM PIPING REPAIR/REFURBISHMENT

Pursuant to 10 CFR 50.90, Virginia Electric and Power Company requests amendments, in the form of temporary changes to the Technical Specifications, to Facility Operating License Numbers NPF-4 and NPF-7 for North Anna Power Station Units 1 and 2, respectively. The proposed changes will allow one of the two service water loops to be isolated from the component cooling water heat exchangers (CCHXs) during power operation in order to refurbish encased in concrete sections of the isolated service water headers. The proposed temporary changes will be valid for two periods of up to 35 days each for implementation of the service water upgrades associated with the repair of the encased in concrete sections of the 24-inch service water supply and return piping to/from the CCHXs. It should be noted that the exposed portions of these lines are being repaired under Technical Specifications Amendment No. 194 for Unit 1 and Amendment No. 175 for Unit 2.

A discussion of the proposed Technical Specifications changes is provided in Attachment 1. The proposed Technical Specifications changes are provided in Attachment 2. It has been determined that the proposed Technical Specifications changes do not involve an unreviewed safety question as defined in 10 CFR 50.59 or a significant hazards consideration as defined in 10 CFR 50.92. The basis for our determination that the changes do not involve a significant hazards consideration is provided in Attachment 3. The proposed Technical Specifications changes have been reviewed and approved by the Station Nuclear Safety and Operating Committee and the Management Safety Review Committee.

NRC approval of the proposed temporary Technical Specification changes by July 1, 1997 is requested to support conducting refurbishment of the affected service water

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headers during late 1997 or early 1998. Should you have any questions or require additional information, please contact us.

Very truly yours,

FOR

James P. O'Hanlon
Senior Vice President - Nuclear

Attachments

cc: U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Suite 2900
Atlanta, Georgia 30323

Mr. R. D. McWhorther
NRC Senior Resident Inspector
North Anna Power Station

Commissioner
Department of Radiological Health
Room 104A
1500 East Main Street
Richmond, VA 23219

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by M. R. Kansler, who is Vice President - Nuclear Operations, for J. P. O'Hanlon, who is Senior Vice President - Nuclear, of Virginia Electric and Power Company. He is duly authorized to execute and file the foregoing document in behalf of that Company, and the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 17th day of December, 19 96.

My Commission Expires: March 31, 2000.

Maggie McClure
Notary Public

(SEAL)

ATTACHMENT 1

DISCUSSION OF CHANGES

NORTH ANNA POWER STATION UNITS 1 AND 2

Discussion of Changes

Introduction

Pursuant to 10 CFR 50.90, Virginia Electric and Power Company requests temporary changes to Technical Specifications 3.7.3.1, "Component Cooling Water Subsystem Operating," and 3.7.4.1, "Service Water System - Operating," for North Anna Power Station Units 1 and 2. The proposed Technical Specifications changes will allow one of the two service water loops to be isolated from the component cooling water heat exchangers during power operation in order to refurbish the concrete-encased portions of the isolated service water headers. **Note, that the exposed portions of these lines are being repaired (one header repair is completed) under TS Amendment No.194 for Unit 1 (license NPF-4) and Amendment No.175 for Unit 2 (license NPF-7).**

This refurbishment activity is part of Virginia Electric and Power Company's extensive service water system restoration project at North Anna Power Station. This project has been the subject of numerous correspondence to the NRC regarding requests for temporary relief from certain regulations to facilitate the pipe refurbishment process. A summary of this related correspondence is included under the heading "Reference Documentation" later in this discussion.

Prior to issuing of Amendments Nos. 194 and 175, service water pipe refurbishment work had been implemented by using the current Action Statement "d" of Technical Specification 3.7.4.1 which allows one of the two redundant service water loops to be removed from service for up to 168 hours (7 days) for "service water system upgrades". This action statement has primarily been used to install temporary code-qualified pipe plugs or blanks to isolate the portion of the system to be refurbished from the operable portion of the system for extended durations. Upon completion of the work, the action statement would then be reentered to remove the plug or blank, thus returning the system to its normal configuration.

The sections of concrete-encased service water piping being addressed by the proposed Technical Specifications change request presents a special challenge. The design of this concrete-encased portion of the service water system (similar to the exposed portions of these pipes currently being repaired) does not permit isolation within the allowed outage time (168 hours) specified for service water system upgrades. The main difference between the arrangement for repair of the concrete-encased portions of SW piping to/from CCHXs and the exposed portions of the piping is the need to install temporary SW lines to provide a second source of SW to the charging pump coolers, air compressor coolers, spent fuel pool (SFP) coolers and the Unit 2 control room (CR) chillers. These temporary lines will be routed from the operating portion of the 36" SW headers

while the 24" headers to CCHXs are being repaired. Also, the duration of restoration of the concrete-encased portions of SW piping to/from CCHXs, which includes draining, sandblasting, inspection, weld repair and coating application, will require approximately 35 days compared to 49 days estimated for replacing of the exposed portions of the piping. Therefore, Virginia Electric and Power Company is requesting temporary changes to the applicable Technical Specifications, i.e., one-time for each service water loop. The purpose of the proposed change request is to allow temporary (one time) changes to the existing service water (SW) and component cooling water (CC) Technical Specifications to permit safe and efficient conduct of the pipe refurbishment project during two-unit power operation. This proposed change request is supported by both deterministic and probabilistic evaluations.

A review of the equipment affected by this phase of the SW restoration project was performed to evaluate the impact on initiating event frequency of previously analyzed design basis events. Since the SW system and CC system are support systems used to remove heat, a failure in either of these systems does not affect the initiating event frequency of any design basis event. Additionally, an estimate of the impact on core damage frequency (CDF) is provided below. The impact on the North Anna Probabilistic Safety Assessment (PSA) during implementation of this project (refurbishment of the concrete-encased piping to/from CCHXs) is similar to the impact of work performed under the ongoing project, Design Change Package (DCP) 91-012, "Repair/Replacement of Exposed SW piping to/from CCHXs", since the scope of work of both projects is repair/replacement of different portions of the same 24" SW headers to CCHXs. The only difference from a PSA standpoint is that the CDF for repair/replacement of exposed piping was calculated based on 140 days supply of CCHXs from one SW header while for this project it is only 70 days. Therefore, the results of the PSA evaluation for exposed piping repairs are conservatively applied to repairs of the concrete-encased sections of the same pipes. The impact on the North Anna PSA during the performance of repair/replacement of exposed SW piping to/from CCHXs (DCP-94-010) was previously evaluated. The overall affect of this work on the core damage frequency while work is in progress is a slight non-risk significant increase in CDF (e.g.,1E-8).

Compensatory actions, contingency measures, and increased minimum system availability requirements will be put in place to reduce risk of damage to the operating SW header and to provide backup means of cooling equipment. Since this project does not affect the containment or any other accident mitigation systems due to installation of temporary piping (see above), there is no significant change in dose consequences. As a result of these evaluations, it has been determined that the system refurbishment activities, described herein, will not result in an increase in probability or consequences of any accident previously evaluated.

The proposed changes to the Technical Specifications requirements provide operational flexibility needed to perform necessary repairs. Implementation of these repairs will not introduce any new accident initiators nor affect the performance of accident mitigation systems. Hence, the activities associated with the proposed changes do not create the possibility for an accident or malfunction of a different type than any previously evaluated.

Based on the evaluations summarized above, it has been determined that operation of the North Anna Units 1 and 2 as allowed by the requested temporary Technical Specifications changes would not involve an unreviewed safety question.

Background

The SW system restoration project, which began in 1992, has three objectives: 1) to minimize corrosion, 2) to prolong the remaining service life of currently acceptable portions of the piping system, and 3) to provide for the repair and/or replacement of degraded piping sections. The project plan consists of two phases, i.e., Phase I and Phase II. The principal Phase I project activities include an extensive cleaning, assessing, repairing, internal coating, and replacement program for over 2100 linear feet of 24-inch diameter buried or concrete encased piping. Phase II includes other long-term system upgrades including repair and/or replacement of accessible piping.

To date, our efforts have concentrated on Phase I of the project with the exception of replacement of the exposed sections of piping to/from CCHXs which was originally included in Phase II. The stagnant and low-flow conditions in these sections of 24-inch diameter pipe create an ideal environment for corrosion. Therefore, refurbishment of these sections has been the highest priority. Refurbishment of the encased portions of 24" SW headers to/from CCHXs will complete Phase I of the project.

Project Discussion

The scope of this project (DCP 91-012) includes refurbishment of the concrete-encased 24" SW headers (approximately 35-40 feet of encased portion for each SW pipe, four pipes total) and short sections (10-15 ft) of exposed portion of each SW pipe (four pipes total) up to first isolation valve on the header. Figure 1 shows a schematic view of the SW piping to/from CCHXs and branches to/from charging pump coolers, air compressor coolers, SFP coolers and Unit 2 CR chillers during normal piping alignment and Figure 2 shows piping alignment during the refurbishment work under this project. Temporary pipes to the charging pumps, air compressors, SFP and Unit 2 CR chillers are branched from 10" lines which are connected upstream of the isolation valves on SW supply headers and downstream of the isolation valves on the SW return headers. All four 24" SW headers are connected to the main 36" concrete-encased SW headers.

From Figure 1, it can be seen that each of the four CCHXs, each branch to the charging pump coolers, air compressor coolers, SFP coolers and Unit 2 CR chillers can be aligned to either of the "A" or "B" main SW loops. This provides an adequate level of operational flexibility and redundant SW supply during normal operating and outage conditions. However, the existing Technical Specifications do not permit isolation of this portion of the SW system for more than a 168-hour (7-day) period and this is insufficient time to perform the necessary repairs/replacements.

Several alternative approaches of plant conditions and system configurations were evaluated as a means to avoid an extended period of operation with only one SW header providing cooling to the CCHXs. One alternative evaluated was to perform the pipe refurbishment activities during a two-unit shutdown. However, there are no two unit outages planned for North Anna and to schedule such an outage would present substantial undue hardship on the Company in terms of power supply and replacement power costs. Consideration was given to performing this work during one or more planned single unit outages. The initial consideration of this approach was to determine if a single unit outage offered any advantages from a required Technical Specifications operability standpoint. It was found that the Technical Specifications operability requirements for the SW and CC systems are no different for single unit versus two-unit operating modes. The Technical specifications operability requirements for these systems are only relaxed during a two-unit shutdown. The results of this review showed that the complex sequence of system alignments and pipe refurbishment activities would be the same with either one unit or two units operating. Hence, temporary Technical Specifications changes would be required to implement the refurbishment activities whether the project was implemented during single-unit shutdown or during non-outage two-unit operation.

Most importantly, however, it was determined that implementation of the refurbishment activities during the proposed two-unit operating mode would have a less risk-significant impact than performing the work during single-unit operation such as during refueling outages. Removal of one SW loop for up to 35 days has the potential to affect the reliability of the CC system and all of the equipment cooled by the CC system, most notably the residual heat removal (RHR) system. The RHR system is in operation for the majority of a refueling outage. Component cooling water is used to cool RHR heat exchangers and, ultimately, the heat is rejected to the SW system via the CCHXs. A reduction in the reliability of the RHR system results from having only one SW header available to the CCHXs during project implementation. A probabilistic Safety Assessment for Unit shutdown conditions is currently not available for North Anna, therefore, a specific value for the increase in risk was not calculated. However, it was determined to be more prudent to implement the project when there are no planned RHR system operations, i.e. during non-outage conditions.

It should be noted that, during project implementation, the temporary alignment of the SW and CC systems will support use of the RHR system to reach cold shutdown (Mode 5) if it becomes necessary as a result of an unplanned unit shutdown.

Installation of a temporary pipe jumper (i.e., a temporary parallel supply and return header to/from the CCHXs) was also evaluated as an alternative approach. However, this alternative requires an even more complex piping configuration than that which is currently installed. In addition, the need to design, procure, and install such a jumper to the appropriate safety-related criteria would be cost prohibitive. Therefore, requesting the temporary changes to the Technical Specifications to allow this portion of the SW system to be isolated for two extended periods of time (one time for each header) was determined to be the appropriate approach.

Even with the proposed extended periods of time for the service water system upgrades, because of the complexity of this systems interconnections, it is necessary to perform a precise series of system alignments and temporary modifications to isolate and blank-off the necessary portions of the service water piping to/from the CCHXs. The sequence outlined below identifies the major steps necessary to isolate, refurbish, and return to service piping associated with the main "A" SW header:

Prior to isolation of header "A", prefabrication and partial installation of temporary 10" supply and return lines to the charging pump coolers, air compressor coolers, SFP coolers and Unit 2 CR chillers will be performed to minimize the effort during 168-hour Action Statement (AS).

- First, it is necessary to isolate and blank the 24-inch SW header to/from the CCHXs and the above mentioned SW consumers. This is accomplished by isolating the entire "A" SW header using Action Statement "d" (the 168-hour Action Statement) of Technical Specification 3.7.4.1 and performing the following in sequence (refer to Figures 1 and 2):

  1) Re-align SW system to supply all applicable loads from the "B" main header and enter the 168-hour Action Statement on the "A" main header.

  2) Drain the "A" main supply and return piping.

  3) Remove valves 1-SW-MOV-108A, 1-SW-MOV-108B, 1-SW-247 and expansion joints 1-SW-REJ-13A and 1-SW-REJ-13D. Install blind flanges in place of expansion joints 1-SW-REJ-13A and 1-SW-REJ-13D.

  4) Install weld-in plugs in pipes 24"-WS-95-151-Q3 and 24"-WS-102-151-Q3 as close to 36" header as practical.

5) Install crossconnect 18"-WS-J01-151-Q3 and connect lines 10"-WS-J04-151-Q3 and 10"-WS-J03-151-Q3. Simultaneously connect the above 10" lines to valves 1-SW-MOV-113B and 2-SW-MOV-213A and 4" lines as shown on Figure 2.

6) Refill the "A" main supply and return piping and return the header to service.

7) Clear the 168-hour Action Statement.

It should be noted that, during the course of refurbishment, piping which must remain operable and applicable temporary piping will be seismically qualified along with other governing design basis requirements.

At this point, both "A" and "B" main SW loops and all their SW consumers are operating normally except that only the "B" header is available to supply the CCHXs. To prevent unnecessarily isolating the CCHXs, the autoclosure feature of the SW MOVs on the "B" header will be defeated.

- Then, with the "A" header isolated to the CCHXs, the following work will be done:

1) Lines 24"-WS-95-151-Q3 and 24"-WS-102-151-Q3 will be cut approximately 3" south of wall E-E. The sections of the lines encased in concrete will be sandblasted, inspected, weld repaired, abrasive blast cleaned and coated with two layers of protective coating. The short exposed sections of the lines will be replaced with the new coated pipes.

2) Previously removed expansion joints and 24" valves will be reinstalled.

3) Entire header "A" will be isolated and drained utilizing Action Statement "d" (the 168-hour Action Statement) of Technical Specification 3.7.4.1.

4) Crossconnect will be disassembled and piping alignment will be returned to normal (Figure 1).

5) Plugs will be removed from 24" headers and portion of pipe where the plugs were installed will be repaired and coated.

6) At the conclusion of pipe refurbishment, the "A" main header will be returned to operation, 168-hour TS AS will be closed and the header would be returned to its normal configuration.

It is evident that during this entire evolution, the CCHXs on both units are being served by only one of the two main SW headers, i.e., the "B" header for the above case. This sequence of system

realignments and piping refurbishment has been conservatively estimated to require approximately 35 days to accomplish. A second 35-day period would be required to accomplish the same refurbishment activities on the "B" header.

Each 35-day period is based on the following work activity schedule (contingency is included in these durations to accommodate unexpected conditions):

1) Approximately 7 days to isolate one main SW loop, install plugs inside the 24" supply and return lines in concrete-encased sections, remove the supply and return valves to/from the CCHX header, and install the 24-inch blind flanges. Simultaneously install the cross-connect piping which will provide a bypass flow path for this partially isolated main SW loop and connect temporary SW lines to supply second source of SW to the charging pump coolers, air compressor coolers, SFP coolers and Unit 2 CR chillers. (These activities must be performed within the 168-hour action statement allowed by Technical Specification 3.7.4.1.)

2) Approximately 21 days for piping refurbishment.

3) Approximately 7 days to isolate one main SW loop, remove crossconnect with temporary piping, remove plugs from inside of 24" to/from CCHXs, remove the 24-inch blind flanges, and reinstall the valves. (These activities must be performed within the 168-hour action statement allowed by Technical Specification 3.7.4.1.)

Specific Changes

Virginia Electric and Power Company proposes to temporarily change TS 3.7.4.1, "Service Water System - Operating," to allow operation of the SW system with one independent source of SW to/from the Unit 1 and Unit 2 CCHXs for two periods of up to 35 days each. The proposed change also allows the automatic closure feature of the SW valves to/from the CCHXs to be defeated during portions of the 35-day periods. This request will also temporarily change TS 3.7.3.1, "Component Cooling Water Subsystem - Operating," to allow the CC subsystems to be considered OPERABLE with only one independent source of SW provided to/from the CCHXs during these 35-day periods. The proposed temporary changes also allow that the provisions of Specification 3.0.4 would not be applicable during the periods of operation with only one SW loop providing cooling to the CC subsystems.

An evaluation of the impact of these proposed temporary Technical Specifications changes on other safety systems was performed. The effect of modified operation of the SW and CC systems due to the refurbishment activities on equipment required by other Technical

Specifications as well as the effect of other Technical Specification action statements on the operation of the SW and CC systems during the two 35-day periods were evaluated. The proposed temporary Technical Specifications changes discussed below address the conclusions of this evaluation.

These proposed changes apply to both the Unit 1 and Unit 2 Technical Specifications unless noted otherwise.

TS 3.7.3.1 "Component Cooling Water Subsystem - Operating"

The following paragraph will replace the existing (denoted with **) footnote for determining the CC subsystems operable:

** For the purpose of service water system upgrades associated with the supply and return piping to/from the component cooling water heat exchangers (CCHXs), which includes encased in concrete and exposed piping from 36" headers to the first isolation valve, the component cooling water subsystems shall be considered OPERABLE with only one service water loop to/from the CCHXs, provided all other requirements in this specification are met. This condition is permitted two times only (once for each SW loop) for a duration of up to 35 days each. During each period of operation with only one SW loop available to/from the CCHXs, the provisions of Specification 3.0.4 are not applicable. Upon completion of the work associated with the second 35-day period, this footnote will no longer be applicable.

TS 3.7.4.1 "Service Water System - Operating"

The following paragraph will replace the existing footnote (denoted with *) to the limiting condition for operation for the service water system to temporarily allow one loop of SW to provide cooling to the CCHXs and to specify additional provisions for operation with the SW system in this configuration:

* For the purpose of service water system upgrades associated with the supply and return piping to/from the component cooling water heat exchangers (CCHXs), which includes encased in concrete and exposed piping from the 36" headers to the first isolation valve, one of the two service water (SW) loops is permitted to temporarily bypass the CCHXs, provided all other requirements in this specification are met. This condition is permitted two times only (once for each SW loop) for a duration of up to 35 days each. During each period of operation with only one SW loop available to/from the CCHXs, four out of four SW pumps (excluding the auxiliary SW pumps) shall remain OPERABLE. With one SW pump inoperable, work may continue provided actions are taken to either restore the pump to OPERABLE status within 72 hours or restore both SW headers to/from the CCHXs to OPERABLE status within 72 hours, or place

both units in HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. During each period of operation with only one SW loop available to/from the CCHXs, the automatic closure feature of the SW valves servicing the CCHXs shall be defeated to ensure SW flow to the CCHXs is not interrupted. The automatic closure will not be defeated when 168 hour Action Statement per Section 3.7.4.1.d is entered simultaneously with 35 day Action Statement. During each period of operation with only one SW loop available to/from the CCHXs, the provisions of Specification 3.0.4 are not applicable, provided two SW loops are capable of providing cooling for all other OPERABLE plant components. Upon completion of the work associated with the second 35-day period, this footnote will no longer be applicable.

Note, that the wording of this request is similar to the earlier approved TS Change Request with the primary difference only in duration of 35 days instead of 49 days of CCHXs operation on one SW header.

Safety Significance

The SW system refurbishment associated with the supply and return piping to/from the CCHXs and the proposed temporary changes to Technical Specifications 3.7.3.1 and 3.7.4.1 have been evaluated to assess their impact on the normal operation of the SW and CC systems and to ensure that the design basis functions of these systems are preserved.

The SW System

The SW system is shared between Unit 1 and Unit 2. The SW system is required to function during all normal and emergency operating conditions. During normal plant operation, the SW system provides cooling water to the CCHXs, charging pump coolers, instrument air compressor coolers, and control room chiller condensers of both units. The largest percentage of header flow is directed through the CCHXs with the remaining small percentage directed to the other components listed.

During the proposed refurbishment activities, one of the two SW headers to/from the CCHXs would be blanked-off from the rest of the main SW loop. Temporary SW lines will be installed to supply the second source of SW to the charging pump coolers, SFP coolers, air compressor coolers and Unit 2 CR chillers (note, that SW lines to Unit 1 CR chillers are not affected by this repair work). These temporary lines will be routed from operating part of the 36" SW headers while the 24" headers to CCHXs are being repaired. Concurrently, a temporary cross-connect, with a manually operated butterfly valve, would be installed between the supply and return headers of the affected main SW loop to provide a flow path bypassing the CCHXs. The installation of a temporary bypass avoids

the situation where, during normal operation, the SW pump would be limited to the remaining flow paths to the above mentioned small SW consumers. This flow rate will be significantly lower than the manufacturer recommended minimum flow rate of 7000 gpm. The temporary cross-connect will be opened whenever the corresponding 24-inch SW header to the CCHXs is isolated for repairs, i.e., during the two 35-day periods. This cross-connect will ensure normal operation of the SW pump aligned on this header.

Operation of the SW system with the cross-connect installed was evaluated for design basis accident (DBA) conditions. The limiting DBA condition for the SW system is a loss-of-coolant accident (LOCA) on one unit with simultaneous loss-of-offsite-power to both units. In response to a LOCA, a safety injection/containment depressurization actuation (SI/CDA) signal would start all four main SW pumps and would isolate SW flow to the CCHXs of the affected unit to ensure adequate flow to the containment recirculation spray heat exchangers (RSHXs) on the accident unit. These automatic functions are discussed in numerous locations throughout the UFSAR. However, during the two 35-day periods with the CCHXs aligned to a single SW header, this normal response to an accident condition (i.e., isolating SW flow to the CCHXs in response to a CDA signal) may also result in the undesired interruption of CC cooling to the unaffected unit. Therefore, the automatic closure feature of the SW valves servicing the CCHXs shall be defeated to ensure SW flow to the CCHXs is not unnecessarily interrupted. A SW system hydraulic analysis has been performed to verify that adequate flow is provided to the RSHXs with the temporary cross-connect installed and throttled open, assuming the occurrence of the most limiting single failure. During the two 35-day periods with their automatic isolation function defeated, the SW valves on the header aligned to the CCHXs would not be considered "automatic" valves and, therefore, would not be subject to the requirements for automatic actuation as required by Technical Specification Surveillance Requirement 4.7.4.1.c.2. The defeating of this automatic valve operation will be addressed by station administrative procedures.

During a portion of the 35 day AS, the SW system will be placed in the 168 hour TS Action Statement 3.7.4.1.d. A more conservative compensatory requirement will be imposed for the periods of operating while in the 168 hour Action Statement. The autoclosure of the SW valves to the CCHXs will be not be defeated while in a 168 hour Action Statement. Thus, a postulated accident scenario, which results in SI/CDA signal, would auto-start the standby SW pumps, automatically open the RSHXs, and automatically close the SW valves to the CCHXs. The temporary operating procedures associated with operation during these 35 day periods will specify that, while in the 168 hour Action Statement, operator action will be required to manually reopen the main SW valves to the CCHXs.

The containment isolation valves in the SW lines to the RSHXs are closed during normal operation. These valves open in response to a

CDA signal to provide SW flow to the RSHXs of the affected unit. Should an SI signal be received without a concurrent CDA signal, all four SW pumps will start but the containment isolation valves at the RSHXs will not open. In this case, it may be necessary to manually secure one of the SW pumps on the partially bypassed header to prevent pump operation at low flow conditions since the additional flow is not needed. This variation from normal pump operation will be addressed by station administrative procedures.

During the course of refurbishment, piping which must remain operable will retain its seismic qualification along with other governing design basis requirements. The temporary cross-connect and temporary piping to the charging pump coolers, air compressor coolers, SFP coolers and Unit 2 CR chillers will also be designed, procured, and installed in accordance with applicable safety-related piping design criteria. It will be installed during the same Technical Specifications action statements that isolate and blank-off the 24-inch headers to/from the CCHXs.

The CC System

The CC system is shared between Unit 1 and Unit 2. The CC system provides cooling water to various safety-related and non-safety-related components, some of which may contain primary coolant. The CC system provides cooling water to components located inside the reactor containment building during normal two-unit operation. This component cooling function, along with the air recirculation cooling coils (cooled by the chilled water system), serves to maintain the containment atmospheric air temperature within the required equipment qualification temperature limits.

The CC system also provides cooling water to the residual heat removal (RHR) heat exchangers during unit shutdown. The design basis for this CC system function is to achieve fast cooldown of one unit (i.e., to reduce reactor coolant system temperatures from 350°F to 140°F in sixteen hours) while maintaining normal operating loads on the other unit. Fast cooldown is achieved using both trains of RHR pumps and heat exchangers. A slow cooldown can be achieved in 30 hours if one train of RHR and two CC subsystems are used.

Operation of the CC system with one SW header available has been evaluated with hydraulic and heat transfer analyses. The following are the results of these analyses.

1) Normal CC heat transfer loads can be met with two CCHXs operated on one SW header with two SW pumps. Hydraulically, up to three CCHXs can be operated on one SW header with up to three SW pumps, if required.

2) The fast cooldown heat transfer loads can be met with three CCHXs operated on one SW header with two SW pumps and the SW supply temperature less than or equal to 75°F. For a SW supply

temperature between 75°F and 78.5°F, a slow cooldown can be achieved with this same system configuration. If the SW supply temperature is greater than 78.5°F, a third SW pump can be aligned to the SW header supplying the CCHXs to affect a slow cooldown of the unit.

3) Containment atmospheric temperature limits can be maintained.

In addition, utilizing only one SW header to supply cooling to the CCHXs has the potential to affect the reliability of the CC system and all of the equipment cooled by the CC system. This is discussed further in the probabilistic safety assessment section below.

The CC system does not function to mitigate the consequences of a DBA. In fact, as the result of a DBA, the CC pumps for the affected unit are deenergized on a CDA signal.

Compensatory Actions and Contingency Measures

The work activities proposed to be performed to accomplish refurbishment of the encased in concrete sections of the 24" diameter SW piping to/from the Unit 1 and Unit 2 CCHXs were evaluated. As a result, specific compensatory actions and contingency measures were developed to provide added assurance of the safe operation of the facility during this project. Listed below is a summary of the compensatory actions and contingency measures which will be implemented as part of this project:

1) During periods of operation in Action Statement "d" of Technical Specification 3.7.4.1 (168-hour action statement) when the SW system is on one header, the following contingency measures will be in place:

   a. An alternate, temporary source of cooling water to the charging pumps will be available. Pipe connections are in place for providing cooling water to the charging pumps coolers by utilizing the fire protection (FP) or primary grade (PG) water systems should the normal service water supply be interrupted. Abnormal Procedure 0-AP-12 "Loss of Service Water" addresses use of this alternate source of cooling water. This alternate cooling source will be staged during the project and can be placed into service in approximately 10 minutes. The procedure requires the charging pumps to be cycled to prevent overheating until one of the alternate cooling sources can be placed into service. Continued seal injection flow provided by the charging pumps will cool the RCP seals and preclude a seal failure due to overheating.

   b. An alternate source of cooling water to the control room/emergency switch gear room (CR/ESGR) air conditioning system will be available. The capability of providing

bearing cooling (BC) water as an alternate source of water to the CR/ESGR cooling system is permanently in place. Abnormal Procedure 0-AP-12 "Loss of Service Water" addresses use of this alternate source of cooling water.

c. It should be noted that, as part of their normal licensed operator continuing training, operating crews are trained on the simulator in the use of Abnormal Procedure 0-AP-12 for loss of service water. In addition, the operating crews have been trained on the simulator for operation of the facility in the 168-hour action statement and implementation of contingencies associated with the service water system restoration project.

2) During the two 35-day periods, temporary pipe clamps and other emergency repair equipment will be staged in the area of construction in the Auxiliary Building. This equipment is provided to facilitate the capability for emergency repair of the SW system piping to assist in recovery from a postulated loss of SW system due to the rupture of the SW system header(s). Procedures and training will be provided to the construction personnel to ensure the effectiveness of this measure.

3) During the two 35-day periods when operating with one SW header supplying the CCHXs, no major maintenance or testing shall be planned on the main SW pumps. This is specified to ensure adequate SW flow capability is available in case of a spurious pump failure. To the maximum extent practical, routine periodic tests (e.g., quarterly pump tests) and preventative maintenance work (e.g., motor checks) will be scheduled prior to or following the 35-day periods. Certain tests may have to be performed during the 35-day periods (e.g., during Technical Specification required emergency diesel start tests, the associated SW pump is considered inoperable due to its emergency power supply being inoperable). For tests which render a SW pump inoperable, the 72-hour action statement (included in the footnote provided as part of this proposed change request) will be entered for performing the test. If a SW pump on the header supplying the CCHXs is rendered inoperable (for testing or any other reason), an operable SW pump from the other header will be realigned to this header to maintain two operable pumps on the header supplying the CCHXs.

4) The project will be scheduled such that no planned unit outages will occur during the 35-day periods when operating with one SW header supplying the CCHXs. This is specified to avoid planned RHR system operation. In the event that an unplanned unit shutdown is required, all pipe refurbishment work will be stopped and conditions will be evaluated to determine the best course of action based on the status of the refurbishment.

5) During the two 35-day periods when operating with one SW header supplying the CCHXs, pipe refurbishment work will be scheduled when SW supply temperatures can be maintained nominally at 75°F (typically October through April). This is specified to minimize the flow requirements to the CCHXs which are required to operate. Higher SW temperatures can be tolerated, but would lengthen a unit cooldown if such an unplanned evolution were required. If SW supply temperatures exceed 78.5°F, a third SW pump will be aligned to the header supplying the CCHXs only if a unit shutdown is required. The 75°F nominal SW target temperature noted above has no impact on the ability to depressurize the containment as a result of a DBA since the accident analysis assumes an initial SW temperature of 95°F.

6) During the course of refurbishment, piping which must remain operable will retain its seismic qualification along with other governing design basis requirements. Temporary, seismic supports will be used as appropriate. Temporary piping will be seismically designed in accordance with the existing design basis requirements for the permanent piping.

Probabilistic Safety Assessment

A review of the equipment affected by this phase of the SW restoration project was performed to evaluate the impact on initiating event frequency. Since the SW system and CC system are support systems used to remove heat, a failure in either of these systems does not affect the initiating event frequency of any design basis event. Additionally, an estimate of the impact on core damage frequency is provided below. The impact on the North Anna Probabilistic Safety Assessment (PSA) during implementation of this DCP is similar to impact of work performed under DCP-94-010 (Repair/Replacement of Exposed SW Piping to/from CCHXs) since the scope of work of both DCPs is the repair/replacement of different portions of the same 24" SW headers to/from CCHXs. The only difference from a PSA standpoint is that CDF for DCP-94-010 was calculated based on 140 days supply of CCHXs from one SW header while per this DCP it is only 70 days. Therefore, results of PSA evaluation for DCP-94-010 are conservatively applied to this DCP.

The impact on the North Anna PSA during the performance of repair/replacement of exposed SW pipe to/from CCHXs (DCP-94-010) was evaluated. The overall affect of this work on the core damage frequency (CDF) while work is in progress is a slight non risk significant increase in CDF. The following limiting conditions were included in the PSA model as assumptions and will be implemented during the 35-day periods when the CCHXs are supplied from one SW header. These assumptions must remain valid for this analysis to be applicable:

- Neither North Anna unit will have RHR in service while only one SW header is available to the CC heat exchangers.

- The only equipment with only one SW header will be the CC heat exchangers. All other equipment which normally has two SW headers available will still have two SW headers operable (except the four 168 hour TS action statements on the main SW headers). Note, that temporary, seismically designed lines to supply charging pumps, Unit 2 CR chillers and the SFP will be connected to the unaffected part of SW header during 168 hour TS AS.

- During single SW header operation to the CCHXs, there will always be two normal SW pumps operable and aligned to the SW header supplying flow to the CC heat exchangers.

Note, that the above assumptions are valid for restoration of the exposed SW piping as well as for the concrete encased piping. Note, also, that the capability of placing a unit on RHR during an unplanned shutdown is maintained and is within the design bases, although it is outside assumptions of the probabilistic analysis.

This analysis was performed using the IPE PSA model. Utilizing only one SW header to supply flow to the CC heat exchangers has the potential to affect the reliability of the CC system and all of the equipment cooled by CC. The affect on the PSA model based on the above assumptions is a slight increase in the frequency of reactor trips and a resulting slight increase in the probability of RHR failure.

The increased frequency of reactor trips is due to the decreased reliability of the CC system to supply cooling to the reactor coolant pump (RCP) motor. When only one SW header is available to the CC heat exchangers the frequency of losing this single header is dominated by the probability of both SW pumps failing. Also considered was the frequency of pipe rupture anywhere in the single available header. When the single SW header fails to supply cooling to the CC heat exchangers, the CC system will heatup causing inadequate cooling for sustained operation of the RCPs. Tripping these pumps results in a reactor trip. The second SW header can be expected to supply other equipment with cooling. This scenario is appropriately modeled combined with the reactor trip with main feedwater available initiating event frequency. A sensitivity analysis shows the increase in CDF to be about 1E-8/year. The total effect of this DCP includes a failure analysis of the reactor coolant pump and motor in case of loss of CCW.

The CC system is also included in the PSA model as a support system for RHR cooling. The RHR system is used to reduce reactor coolant system temperatures from 350°F (hot shutdown) to 140°F (cold shutdown). The only accident initiator which requires the unit to be cooled down and placed on RHR are sequences which are initiated with a steam generator tube rupture. (Note, that for the North Anna plant design, RHR is separate from the safety injection system and the low head safety injection pumps). The increased probability for

the loss of RHR when only one SW header is available to the CC heat exchangers, is estimated using fault tree analysis and is dominated by failure of both SW pumps. The probability for the loss of two SW pumps aligned to the CCHXs is estimated to be 1.5E-4. The effect of this increase in RHR failure probability was determined by adding this probability to the top single event in the RHR function and recalculating the new CDF. The resulting increase in CDF as a result of RHR system failure following a steam generator tube rupture is about 1E-8 per year.

The CC system is further included in the PSA model as part of the loss of RCP seal cooling as an initiating event and as a loss of function during other initiating event scenarios. The effect on the probability for a loss of RCP seal cooling due to losing CC cooling to the RCP thermal barriers is negligible due to the high reliability of the charging system to provide seal injection.

The total effect of this pipe refurbishment project on core damage frequency (CDF) was estimated by a sensitivity analysis combining both the change in the reactor trip initiating event frequency and the increased failure probability of RHR. It was evaluated that during implementation of this project, CCHXs will be supplied from one SW header for 70 days (35 x 2=70), therefore, the increase in CDF previously evaluated for restoration of the exposed SW piping to/from CCHXs based on 140 days is conservative. This DCP does not affect the containment systems and there would not be any significant change in off-site dose since the containment heat removal portion of the SW system is not affected and the increase in CDF is insignificant. The small increase in CDF calculated for the repair activities and the procedure developed to provide contingency actions result in the conclusion that this work does not represent a significant increase in core damage frequency.

The assumption that neither unit is utilizing RHR while only one SW header is available, is due to the inability to quantify CDF associated with shutdown conditions. PSA experience indicates that this could be an increase in risk. If a steam generator tube rupture occurs, the unit response should be in accordance with approved procedures (including placing the unit on RHR as necessary), and all work on the other header will be stopped to avoid damage of the operating header due to construction mishaps. If RHR is needed for any other reason, then the best course of action for restoring the second SW header and utilizing RHR cooling should be evaluated based on the project status.

Conclusions

The purpose of this proposed change request is to allow temporary changes to the existing Technical Specifications requirements to permit refurbishment of the SW piping to the CCHXs during two-unit

power operation. The design of the affected section of SW piping does not permit isolation for a sufficient period of time under the current Technical Specifications to allow the necessary work to be performed. The proposed changes have been thoroughly evaluated and it has been determined that operation of the North Anna Power Station Units 1 and 2 with the requested temporary Technical Specifications changes would not involve an unreviewed safety question.

1) A review of the equipment affected by this phase of the SW restoration project was performed to evaluate the impact on initiating event frequency. Since the SW system and CC system are support systems used to remove heat, a failure in either of these systems does not affect the initiating event frequency of any design basis event. Additionally, an estimate of the impact on core damage frequency is provided below. The impact on the North Anna Probabilistic Safety Assessment (PSA) during implementation of this restoration work is similar to the impact of work performed under previously approved Amendments Nos.194 and 175 for the exposed sections of these pipes since the scope of work for both cases is repair/replacement of different portions of the same 24" SW headers to CCHXs. The only difference from a PSA standpoint is that CDF for repairs of exposed sections was calculated based on 140 days supply of CCHXs from one SW header while for repairs of encased in concrete sections, it is only 70 days. Therefore, results of PSA evaluation for repairs of exposed sections are conservatively applied to repairs of encased in concrete sections.

2) The proposed changes would not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report. The proposed changes are only temporary and provide for refurbishment of the SW piping to the CCHXs. SW system operation with the cross-connect installed and the autoclosure feature of the SW MOVs to the CCHXs defeated was evaluated for design basis accident (DBA) conditions. The DBA condition for the SW system is a loss-of-coolant accident on one unit with simultaneous loss-of-offsite-power to both units. A SW system hydraulic analysis has been performed to verify that adequate flow is provided to the containment recirculation spray heat exchangers (RSHXs) with the temporary cross-connect installed and throttled open, assuming the occurrence of the most limiting single failure. Therefore, there is no increase in probability or consequences of the DBA condition.

Utilizing only one SW header to supply flow to the CCHXs has the potential to affect the reliability of the CC system and all of the equipment cooled by CC. As discussed above, the activities to be performed during the refurbishment project and

the various system alignments required were evaluated using the IPE PSA model for North Anna Power Station. The effect on the IPE PSA model is a slight increase in the frequency of reactor trips and an increase in the probability of RHR failure. The total effect of this pipe refurbishment project was estimated by a sensitivity analysis combining both the change in the reactor trip initiating event frequency and the increased failure probability of RHR resulting in a slight non-risk significant increase in CDF.

During the course of refurbishment, piping which must remain operable will retain its seismic qualification along with other governing design basis requirements. Temporary piping will be seismically designed in accordance with the existing design basis requirements for the permanent piping. Compensatory actions, contingency measures, and system availability requirements will also be provided by station administrative controls. These limitations serve to reduce risk of damage to the operating SW header and provide backup means of cooling equipment. Since this project does not affect the containment or any other accident mitigation systems, there is no significant change in dose consequences.

3) The proposed changes would not create the possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report. The proposed changes to the allowed outage times only provide operational flexibility needed to perform necessary repairs. During the project, there will be a significant time period when all the CCHXs are aligned to one SW loop. The possibility of an interruption of SW supply to the heat exchangers during a DBA is eliminated by defeating the closure of the 24-inch SW isolation MOVs to the CCHXs on a SI/CDA signal. Both SW headers will be available for equipment required for safe shutdown of the units (i.e., RSHXs, charging pumps, and CR/ESGR chillers). The SW pipe repair activities and the installation/removal of the SW cross-connect and temporary piping do not create the possibility for a malfunction of equipment different than previously evaluated. Results of the Johnston Pump NPSH test proved to be satisfactory for the anticipated SW pump flow rates under modes of station operation for this project, therefore, the possibility for an accident of a different type than was previously evaluated in the Safety Analysis Report will not be created. Based on the above, implementation of the restoration project and approval of the proposed Technical Specifications changes will not introduce any new accident initiators nor affect the performance of accident mitigation systems.

4) The proposed changes practically will not reduce the margin of safety as defined in the basis for any Technical Specification. The proposed changes to the schedule only

provide operational flexibility to perform the required SW pipe refurbishment. The Technical Specifications continue to require the SW and CC systems to remain functional during the period with a single SW supply to the CCHXs. As stated in item 2) above, the SW system is fully capable of performing its DBA function during the course of the pipe refurbishment project with the proposed Technical Specification changes in place. The effect of this pipe refurbishment project on CC system reliability was estimated by a sensitivity analysis combining both the change in the reactor trip initiating event frequency and the increased failure probability of RHR resulting in about a 1E-8 per year increase in CDF. Since this project will not affect the containment systems, there would not be any significant change in off-site dose, except that resulting directly from the increase in CDF.

Based on the above evaluation, the proposed changes to the Technical Specifications will not adversely affect the safe operation of the plant. Therefore, this proposed change request for North Anna Units 1 and 2 does not result in an unreviewed safety question as defined in the criteria of 10 CFR 50.59.

Reference Documentation

Listed below are docketed correspondence which have been issued for previous SW refurbishment work associated with Phase I of the service water restoration project. These items are listed in chronological order.

Letter Serial No. 92-287, dated May 18, 1992
This letter informed the NRC of our plans to perform extensive refurbishment activities for restoration of certain portions of the SW system as part of the Phase I project.

Letter Serial No. 92-450, dated July 16, 1992
This letter provided the basis for temporary exemption from the requirements of 10 CFR Part 50, Appendix A, General Design Criterion 2 (GDC-2), "Design Basis for Protection against Natural Phenomenon," for Stages 1, 2, 3, and 4 of Phase I of the project.

Letter Serial No. 92-450A, dated September 11, 1992
This letter requested an additional temporary exemption from the requirements of 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants," for Phase I/ Stage 1 of the project. The scope of Stage 1 addressed the 24-inch lines to and from the Unit 1 recirculation spray heat exchangers. The details of these temporary requests, particularly for Stage 1, were discussed with the NRC at meetings held on August 24, September 28, and November 2, 1992.

NRC Letter dated October 30, 1992
This NRC letter provided the "Environmental Assessment and Finding of No Significant Impact" associated with our exemption request.

Letter Serial No. 92-450B, dated November 4, 1992
This letter docketed responses to two sets of NRC questions received by fax/phone on September 14, 1992 and October 14, 1992.

Letter Serial No. 92-450C, dated November 4, 1992
This letter provided revised Phase I plans which included deletion of Stage 2 (new 36-inch manways) and revised the schedule for Phase I.

NRC Letter dated December 3, 1992
This letter provided NRC approval of the temporary exemptions from the requirements of 10 CFR Part 50, Appendix A, GDC-2, for North Anna Units 1 and 2, and 10 CFR Part 50.49, for North Anna Unit 2, for the Phase I/ Stage 1 project.

Letter Serial No. 93-067, dated February 17, 1993
This letter provided the description and basis for justification of a temporary exemption from the requirements of 10 CFR Part 50, Appendix A, GDC-2, for North Anna Units 1 and 2 during the Phase I/

Stage 3 SW system restoration activities. The scope of Stage 3 was similar to Phase I/ Stage 1 in that it addressed the 24-inch lines to and from the recirculation spray heat exchangers on Unit 2.

Letter Serial No. 93-067A, dated July 12, 1993
This letter withdrew the GDC-2 exemption request required for Stage 3 due to a change in implementation schedule.

Letter Serial No. 93-378, dated July 30, 1993
This letter provided the description and basis for justification of a temporary exemption from the requirements of 10 CFR Part 50, Appendix A, GDC-2 for North Anna Units 1 and 2 during Phase I/ Stage 4 SW system restoration activities. The scope of Stage 4 involved restoration of the 24-inch auxiliary service water supply lines from Lake Anna to the main service water headers.

NRC Letter dated September 30, 1993
This NRC letter provided the "Environmental Assessment and Finding of No Significant Impact" associated with our Stage 4 exemption request.

NRC Letter dated December 27, 1993
This letter provided NRC approval of the temporary exemption from the requirements of 10 CFR Part 50, Appendix A, GDC-2, for North Anna Units 1 and 2 for the Phase I/ Stage 4 project.

Letter Serial No. 95-147, dated March 30, 1995
This letter requested temporary Technical Specifications Amendments for refurbishment of SW exposed piping to/from CCHXs.

Letter Serial No. 95-381, dated August 24, 1995
This letter provided a response to NRC request for additional information on proposed temporary Technical Specification change request on refurbishment of SW exposed piping to/from CCHXs.

NRC Letter dated October 11, 1995
By this letter NRC informed Virginia Power and Electric Company that Amendments Nos.194 and 175 were issued in conjunction with Service Water system restoration (Repair/Replacement of Exposed SW Piping to/from CCHXs).

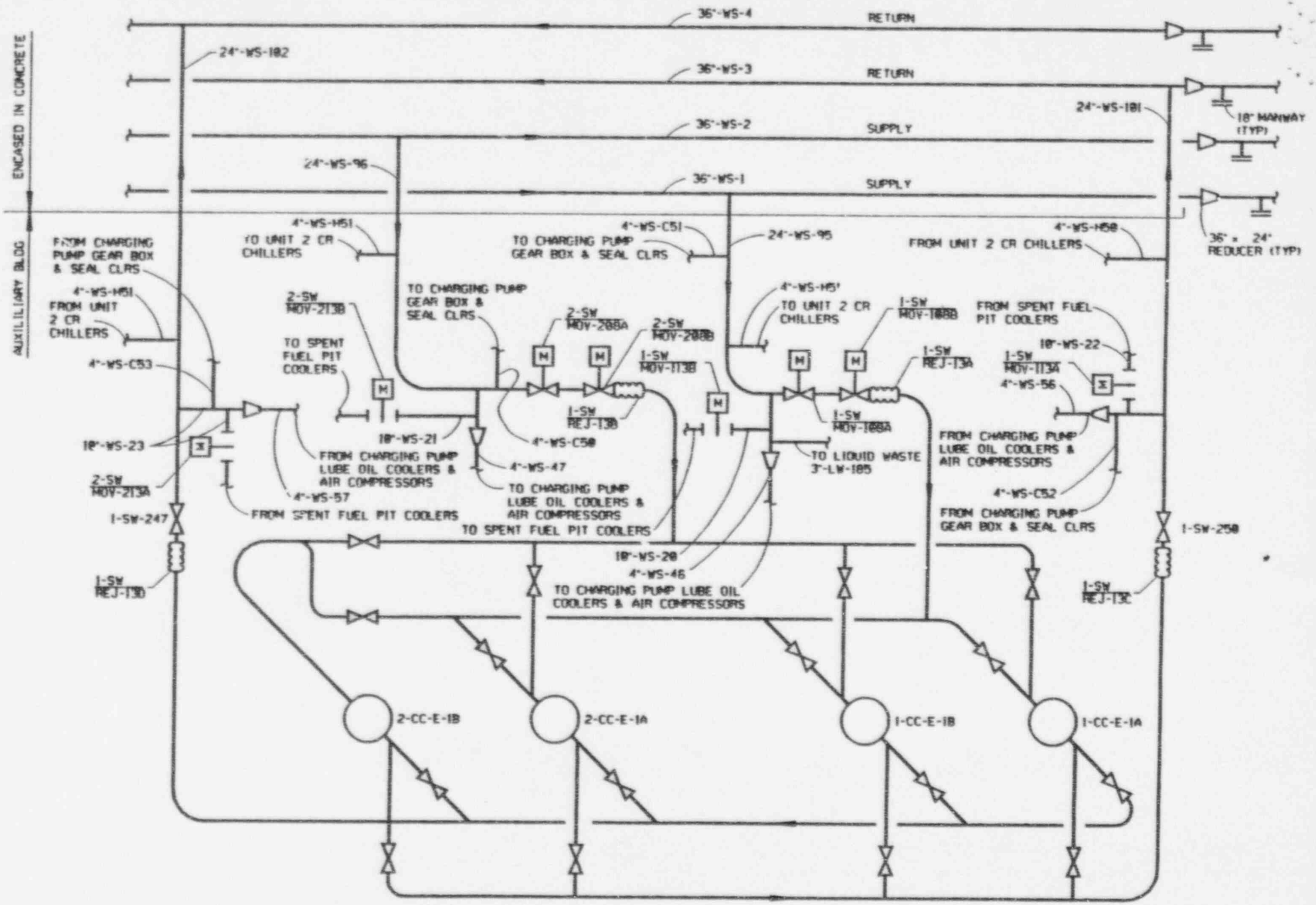

FIGURE 1
SIMPLIFIED FLOW DIAGRAM - SW PIPING TO/FROM CCHXS
NORMAL ALIGNMENT

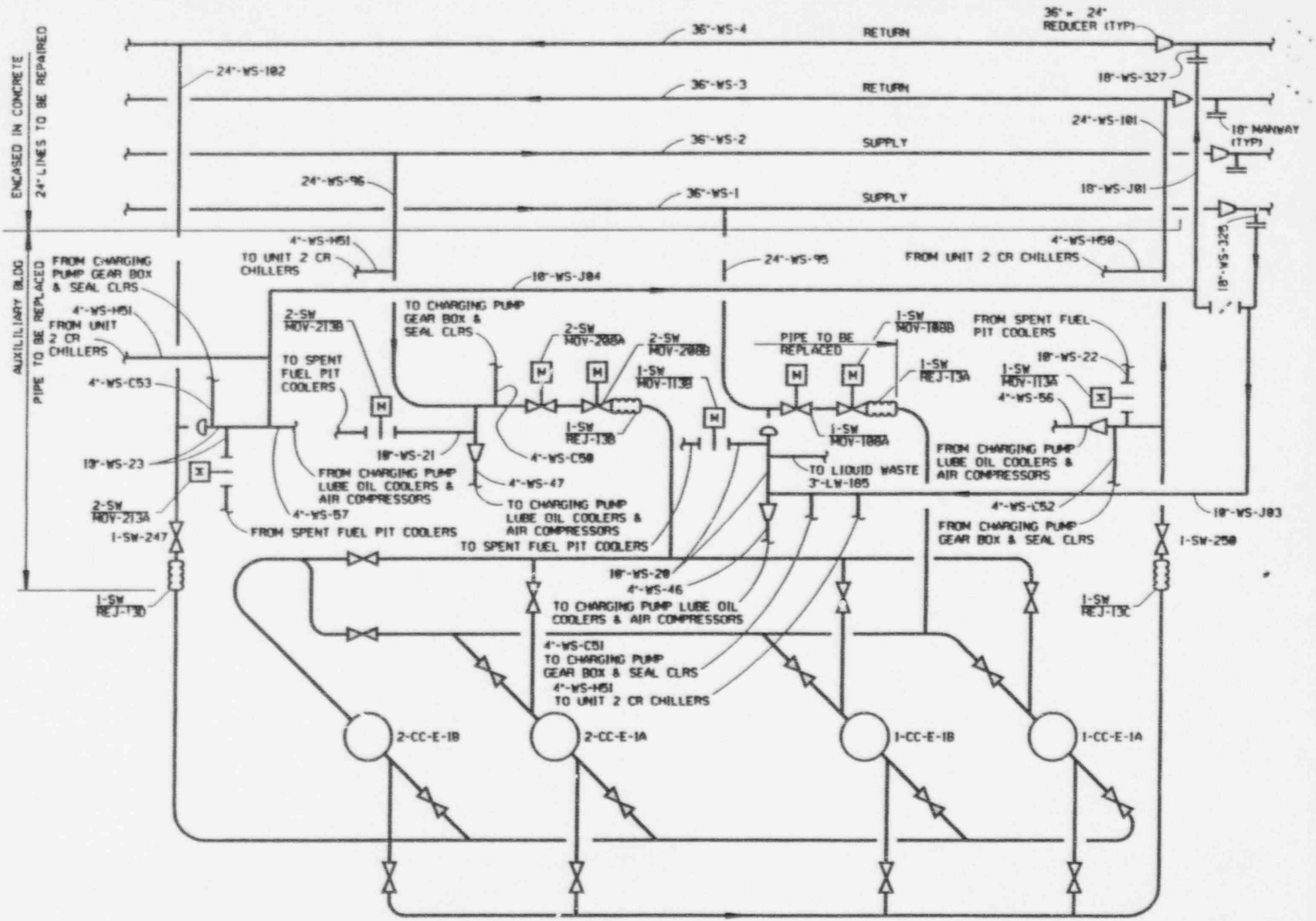

FIGURE 2

SIMPLIFIED FLOW DIAGRAM - SW PIPING TO/FROM CCHXS
ALIGNMENT DURING REPAIRS OF HEADER A (LINES 24"-WS-95 & 24"-WS-102)