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

September 21, 1992

Docket Nos. 50-338
and 50-339

LICENSEE: Virginia Electric and Power Company (VEPCO)

FACILITY: North Anna Power Station, Unit Nos. 1&2 (NA-1&2)

SUBJECT: MEETING SUMMARY OF AUGUST 25, 1992

A meeting was held on August 25, 1992 with representatives of the NRC and VEPCO to discuss the NA-1&2 Service Water (SW) restoration program. An attendance list is provided in Enclosure 1. Handouts provided by VEPCO are provided in Enclosure 2.

By letter dated May 18, 1992 VEPCO informed the NRC of plans to perform extensive refurbishment activities for restoration of certain portions of the NA-1&2 SW system. Implementation of the SW system repair and replacement project will require removing the surrounding earth and/or concrete encasement of portions of normally buried SW headers. As a result, the normal design bases protection against natural phenomena afforded by the earth and concrete encasement will be removed from these components. By letter dated July 16, 1992, VEPCO requested a temporary exemption from the requirements of 10 CFR Part 50, Appendix A, Criterion 2 (GDC-2), "Design basis for protection against natural phenomena," for NA-1 for Phase 1 of the SW restoration project.

Pitting corrosion resulting from microbiological-influenced corrosion has been identified as an ongoing problem in the NA-1&2 SW system. Stagnant and low flow 24" buried and concrete encased piping have been identified as being most susceptible. Existing corrosion products prevent chemical treatment (corrosion inhibitors and biocides) from being effective. VEPCO indicated that the solution to the NA-1&2 SW system degradation is: (1) arrest the root cause of the existing corrosion damage; (2) Prolong the remaining life of the current piping, and (3) repair and/or replace degraded piping sections.

The SW restoration program will be done in five stages and will cover the years 1992 thru 1995. The NA-1 Phase 1 plan will be completed during the 1993 NA-1 steam generator (SG) replacement programs (January 2 to May 31, 1993). The specific relief from GDC-2 as noted above, will be from December 1, 1992 to June 30, 1993. The 30 day periods prior to and after the SG replacement program will allow excavation of buried SW lines prior to the NA-1 shutdown and subsequent backfill after NA-1 restart.

The Phase 1 project includes the refurbishment of approximately 2100 linear feet of buried or concrete encased 24" diameter SW piping. Approximately 600 linear feet of 24" pipe will be replaced with new carbon steel pipe. Also, access manways will be added in strategic locations.

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As noted in the Enclosure 2 handouts, VEPCO presented an analysis of compensatory actions and contingency measures to be implemented during the SW restoration program to minimize construction mishaps and minimize severe weather effects.

A probabilistic risk assessment (PRA) was made to optimize the safety aspects of construction techniques and to identify measures which will minimize risk associated with the SW restoration program. The PRA was employed also to determine the effects, if any, of the project on the probability of core damage of operating units and provide a documented basis for a temporary exemption from GDC-2.

In summary, VEPCO indicated the SW preservation project will not have a significant effect on the risk of a core damage event during the time of the project.

(Original Signed By)

Leon B. Engle, Project Manager
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Enclosures:
1. Attendence List
2. Meeting Handouts

cc w/enclosures:
See next page

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ENCLOSURE 1

Attendance List

Meeting with VEPCO

August 25, 1992

NA Service Water Restoration Project

NRC	VEPCO	HALLIBURTON NOS
K. Campe	D. Benson	A. Afzali
L. Engle	J. Lee	M. Donovan
B. LeFave	R. Rasnic	
S. Rosenberg	M. Sertain	
J. Schiffgens		
N. Stinson		

ENCLOSURE 2

VIRGINIA POWER

NORTH ANNA POWER STATION

SERVICE WATER RESTORATION PROJECT

Augusi 25, 1992

Agenda

North Anna Service Water Restoration Project Meeting

• Project Overview	D. L. Benson
• Project Scope (Previous Correspondence)	
- Phase I	M. D. Sartain
- Licensing Summary - Exemption from GDC-2	J. B. Lee
• Supplemental Exemption from 10 CFR 50.49	J. B. Lee
• Phase I, Stage 1 (Detailed Scope)	M. D. Sartain
- Sequence of Activities & Affected Systems	
- Training and Mock-up	
- Technical Specification Action Statement Entries	
- Compensatory Actions & Contingency Measures	
• Probabilistic Risk Assessment	M. D. Sartain
- Results	
• Conclusions	D. L. Benson

Project Overview

Problem:

- Identified Service Water System Degradation
  - Continued pitting corrosion as a result of Microbiologically Influenced Corrosion (MIC)
  - Stagnant and low flow 24" buried and concrete encased piping most susceptible
  - Existing corrosion product prevents chemical treatment (corrosion inhibitors and biocides) from being more effective

Solution:

- Arrest the root cause of the existing corrosion damage
- Prolong the remaining life of the current piping
- Repair and/or replace degraded piping sections

Project Scope

Phase I

Refurbishment of approximately 2100 linear feet of buried or concrete encased 24" diameter service water piping

- Enhanced chemical treatment to control sulfate-reducing bacteria in system
- Repair program for concrete encased portions of pipe
  - Approximately 1500 linear feet of pipe
  - Hydrolasing and/or blast cleaning
  - Pipe condition assessment
  - Weld repairing as required
  - Epoxy patch and coating
- Replacement program for direct buried portions of pipe
  - Approximately 600 linear feet of pipe
  - New carbon steel pipe with internal coating and external coating / wrapping
  - Addition of access manways in strategic locations

Project Scope
(continued)

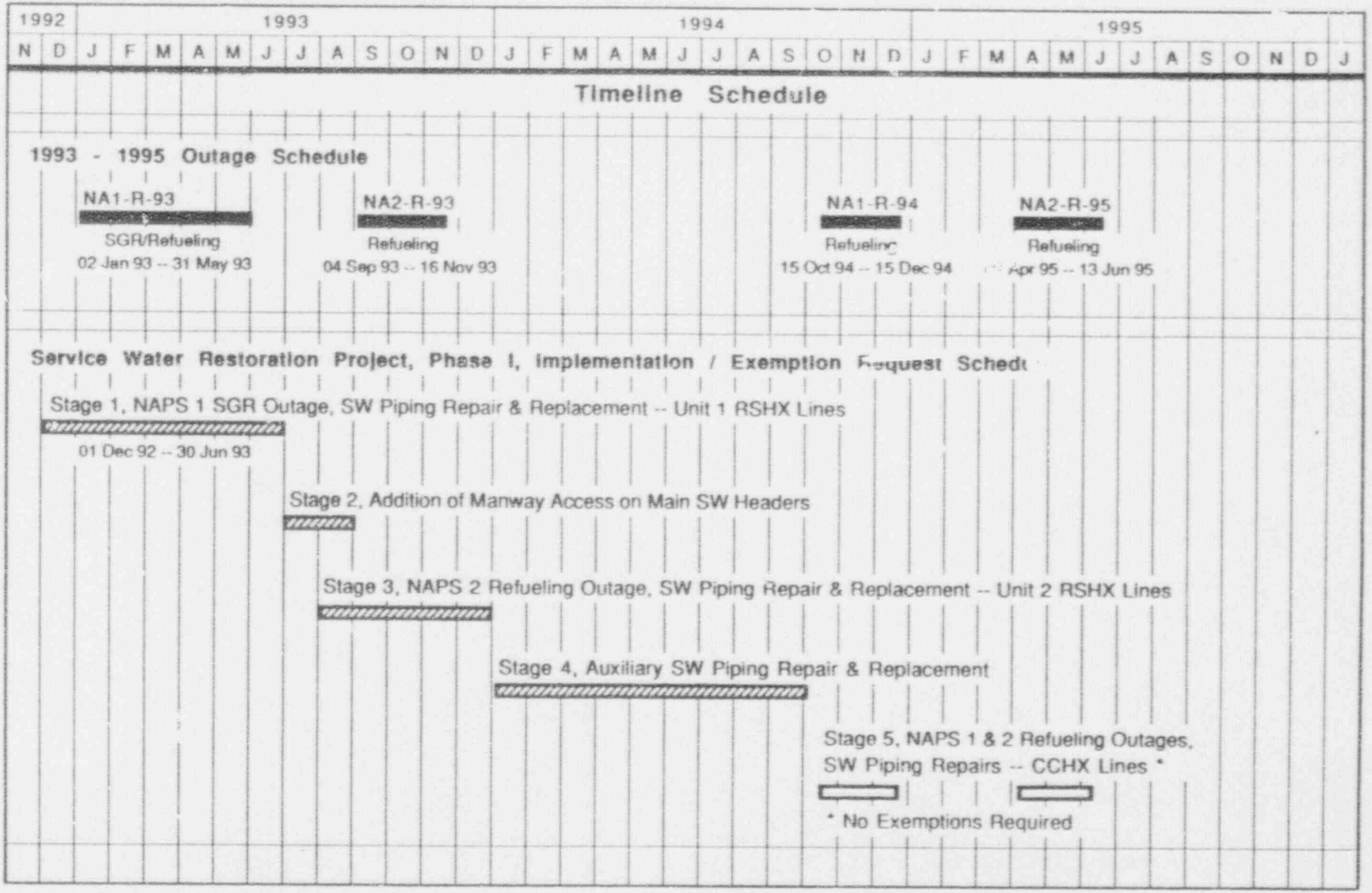
Proposed Phase II Activities

- Service water reservoir relining
- Recoating internal of the 36" service water headers
- Repair and/or replacement of other accessible piping

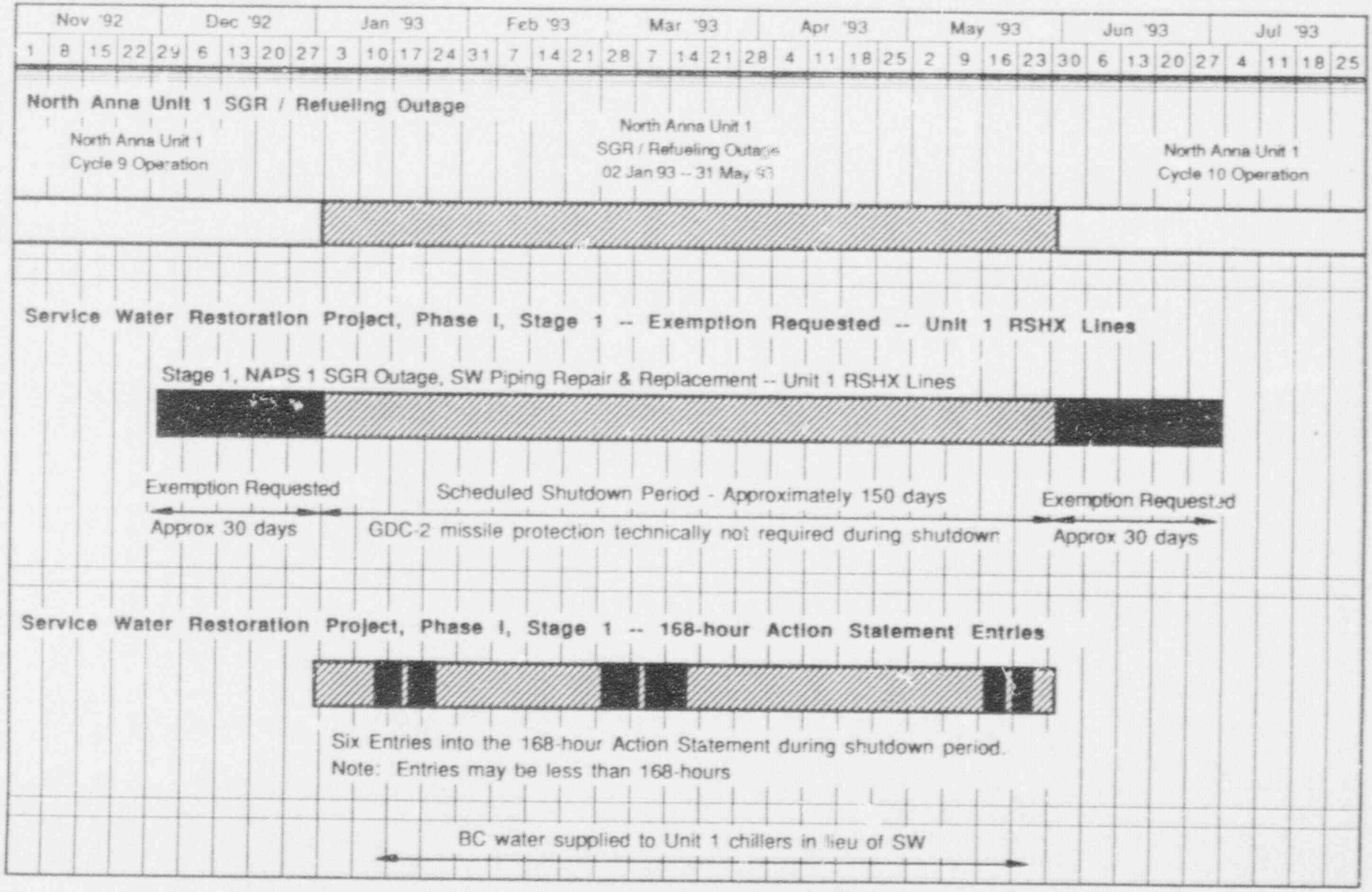
Phase I Project Implementation Plan

- Phase I is divided into five stages
  - Stage 1 - Unit 1 Recirculation Spray Heat Exchanger Headers
  - Stage 2 - Addition of Manways to 36" Service Water Headers
  - Stage 3 - Unit 2 Recirculation Spray Heat Exchanger Headers
  - Stage 4 - Auxiliary Service Water Headers
  - Stage 5 - Component Cooling Water Heat Exchanger Headers
- Request for temporary exemption from GDC-2
  - Required for Stages 1 through 4

ATTACHMENT 1
NORTH ANNA POWER STATION
SERVICE WATER RESTORATION PROJECT -- PHASE I



NORTH ANNA POWER STATION
SERVICE WATER RESTORATION PROJECT -- PHASE I, STAGE 1



Licensing Issues

- Request temporary relief for the requirements of GDC-2, "Design bases for protection against natural phenomena," to allow excavation of buried service water lines and other utilities prior to unit shutdown and subsequent backfill after unit restart
  - Allows removal of missile protection for service water piping and electrical duct banks
- Specific relief is being requested from December 1, 1992 to June 30, 1993 for Phase I, Stage 1 of the project
- Compensatory actions and contingency measures established to reduce risk and possible consequences
- Probabilistic Risk Assessment (PRA) methods were used to support this exemption request to minimize risk associated with construction activities
- Utilization of existing 168-hour Action Statement in Technical Specification Limiting Condition for Operation 3.7.4.1
- Supplemental exemption request from 10 CFR 50.49 for environmental qualification basis of the Unit 2 Control Room A/C chillers

Licensing Submittals

- Initial submittal to the NRC on May 18, 1992 outlined the project scope and anticipated regulatory relief dates
- Exemption request letter submitted to the NRC on July 16, 1992 provided additional information in support of Phase I, Stage 1 of the project
- Meeting with the NRC reviewers on August 25, 1992 to provide additional detailed information with respect to our exemption request
- NRC approval requested by mid-November 1992 for Phase I, Stage 1
- Forthcoming submittals are planned to support Stages 2 & 3 and Stage 4 of the project

Environmental Qualification of Control Room Chillers Supplemental Exemption Request

- During the review of the engineering package, it was determined that an additional exemption would be required
- Isolating the service water supply and return headers to the recirculation spray headers also isolates service water from the Unit 1 control room chillers
- The project plans to temporarily provide bearing cooling water to the Unit 1 chillers which can be supplied from Unit 1 or Unit 2 bearing cooling system
  - Provides a back-up to the Unit 2 chillers
  - Maintains normal control room temperatures
- However, our review determined that the non-safety related water supply to the Unit 1 chillers effects the environmental qualification basis for the Unit 2 chillers
  - 10 CFR 50.49 environmental qualification basis for the Unit 2 control room chillers is provided by the back-up capability of the Unit 1 chillers

Environmental Qualification of Control Room Chillers Supplemental Exemption Request (continued)

- There is an accident scenario which makes this a concern, but a unique set of circumstances must occur
  - HELB outside the MSVH in a specific area, plus
  - MSTV stuck open, and
  - Loss of offsite power or a seismic event
- The PRA evaluated the failure probability of the bearing cooling system as a temporary water supply for the Unit 1 chillers with Unit 2 operating
  - Low probability of occurrence:

    HELB + BC unavailable <1.0 EE-7 (Preliminary)

    DBE with HELB + MSTV failure 2.0 to 9.0 EE-7 (Preliminary)
- Plan to submit a supplement to our exemption request by September 4, 1992

Phase I, Stage 1 Sequence of Activities

Pre-Outage

1. Install temporary Unit 1 control room chiller piping jumpers
2. Complete alleyway excavation to expose service water piping and duct banks including installation of seismic supports for electrical duct banks

Outage

3. Enter T.S. Action Statement and plug service water lines west of the manways (two near reducers, two near manways) and place temporary water supply to the control room chillers in service
4. Complete final alleyway excavation, shoring, and temporary support (if not completed in Step 2)
5. Remove all service water lines in the alleyway
6. Perform cleaning, assessment, weld repair, and coating of concrete encased portion of all four lines simultaneously

   Note: At an intermediate point in the restoration effort, enter T.S. Action Statement to relocate plugs in service water lines west of the manways (two near reducers, two near manways)

Phase I, Stage 1 Sequence of Activities
(continued)

Outage (continued)

7. Install new piping, manways, and vault in alleyway and tie-in at both ends following completion of repairs
8. Touch-up coat weld areas of new piping inside and out
9. Enter T.S. Action Statement to remove plugs in service water lines west of the manways and to hydrotest new lines and restore the system to operable status

Post-Outage

10. Backfill and replace concrete in alleyway

Training and Mock-up

- Use of full scale pipe mock-up of most complicated configuration to qualify cleaning, assessing, repairing, and coating processes and to train and qualify personnel

- Mock-up utilizes actual sections of corroded service water piping where possible

168-hour Action Statement Sequence of Activities

Note: Unit 1 must be shutdown prior to entering the T.S. Action Statement

1. Enter the 168-hour T.S. Action Statement to isolate one service water loop
2. Open the isolated loop and install Code acceptable blocking devices in the supply and return lines to the recirculation spray heat exchangers to temporarily isolate the repair area from the main portion of the service water loop
3. Return the main portion of the service water loop to service
4. Wait approximately 24 hours
5. Enter the 168-hour T.S. Action Statement to isolate the other service water loop
6. Open the isolated service water loop and install Code acceptable blocking devices in the supply and return lines to the recirculation spray heat exchangers
7. Return the main portion of the service water loop to service

Note: Repeat steps 1 through 7 to relocate the blocking devices and to return the service water lines to the recirculation spray headers to service

Service Water Subsystems Affected During Outage

- Supply and return piping to Unit 1 recirculation spray heat exchangers. Not required to be operable during operating Modes 5 or 6
- Supply and return piping to Unit 1 control room and relay room air conditioning chillers. Temporary bearing cooling jumper will be provided to maintain operation of one chiller during outage
- Back-up supply and return piping to Unit 1 containment recirculation air coolers. Normal chilled water cooling source will remain available for containment cooling during outage
- Back-up supply to Unit 1 auxiliary feedwater pumps. Not required to be operable during operating Modes 5 or 6
- One supply and one return path from auxiliary service water system

Compensatory Actions and Contingency Measures

Specific compensatory actions and contingency measures were identified to further enhance safe implementation of the project. These measures are targeted at three areas:

1) To minimize the possibility of occurrence and the affect of postulated construction mishaps

2) To minimize the effect of severe weather and tornado / high wind generated missiles

3) To enhance system reliability through use of back-up cooling water sources to critical components during the 168-hour Action Statements (during one header operation)

Actions to Minimize Construction Mishaps

- Electronic scanning and non-destructive locating methods will be used to accurately determine underground locations of piping, electrical duct banks, and other buried utilities prior to excavation
- Machine excavation will be limited to near surface depths. The bulk of the excavating will be by hand operated power and manual tools
- Physical barriers will be used to keep vehicles a safe distance from the excavation
- All lifting and rigging components will be inspected and load tested. Lifting of equipment or construction material directly over the excavation will be prohibited while the service water lines are exposed and operable
- Direct verbal communications (using dedicated radios if necessary) will be maintained between equipment operators and supervisors/observers

Actions to Minimize Construction Mishaps
(continued)

- Temporary supports will be utilized to ensure that exposed electrical duct banks and service water piping to Unit 1 chillers retain their seismic qualification
- Engineering review will be performed for shoring and temporary supports in the excavation
- The duration of the actual exposure of the service water piping will be minimized to the extent possible by careful sequencing of construction activities
- Restrictions on flammable materials in and near excavation
- Worker training and shift briefings will be conducted

Actions to Minimize Severe Weather Affects

- Severe weather procedures will be utilized to provide notification to construction forces to clear the area of vehicles and loose materials in the event of a tornado watch or other hign wind conditions
- Loose materials in and around the excavation will be limited to only those absolutely necessary for activities in progress
- Adequate wind protection and heating will be provided during freezing weather conditions

Actions During 168-hour Action Statements

- A temporary supply and return path to the Unit 1 control room chillers from the common bearing cooling header will be installed. This will remain available for the entire duration of the Unit 1 service water outage work
- A temporary water supply from either the primary grade water or fire water systems will be available as a contingency to the charging pump coolers should the normal service water supply be interrupted
- Emergency pipe repair materials will be staged in key areas to reduce response time in the event of a leak or rupture. Procedures for emergency pipe repairs will be developed and plant personnel will be trained in the use of these procedures and materials
- Three of the four main service water pumps and both auxiliary service water pumps will be operable as a prerequisite for entry into the Action Statement
- Flood prevention and mitigation measures will be in place

Probabilistic Risk Assessment Study Objectives

- To optimize the safety aspects of construction techniques and sequences and to identify specific measures to minimize risk associated with the project
- Determine effects, if any, of service water restoration project on probability of core damage of operating units
- Provide documented basis for temporary exemption from GDC-2, "Design Basis Protection Against Natural Phenomena"

Key Items Potentially Contributing to Increased Risk

Excavation and Backfill Related

- External events resulting in damage to service water piping or electrical duct banks
- Construction mishaps resulting in damage to service water piping or electrical duct banks

System Operation Related

- Repeated use of 168-hour Action Statement (i.e., loss of system redundancy for Unit 2 during one header operation)

Analysis of External Events Contribution to Change in Risk

- Identification of potential hazards
- Qualitative screening of external events based on NUREG/CR-4840 approach
- Quantitative analysis of unscreenable external events
  - Seismic events
  - Tornado / high wind

Excavation and Backfill Related

Probability of External Events During Excavation / Backfill Period

Event	Annual Frequency	Probability Per 60 Day
Earthquake 0.18g	0.4 to 2.0 EE-3	0.66 to 3.4 EE-4
Tornado	1.0 to 3.3 EE-5	1.6 to 5.4 EE-6

Consequences of Damage to Cable Ducts

- Reviewed cables located in two exposed ducts to identify critical components which may fail if duct is damaged. Specifically, cables were reviewed to identify any accident initiating components and any accident mitigating components
- No postulated equipment failures will lead to accident initiating events
- Postulated failures of accident mitigating components consist of the following safety-related pumps
  - 2 / 3 auxiliary feedwater pumps
  - 2 low head safety injection pumps
  - 2 outside recirculation spray pumps

Excavation and Backfill Related

Consequences of Damage to Service Water Lines

- Large rupture of one service water line
  - Loss of service water redundancy
  - Shutdown operating units if not restored in 72 hours
- Large rupture of two service water lines
  - Total loss of service water (i.e., initiating event)

Excavation and Backfill Related

Analysis of
Construction Mishaps Contribution to Change in Risk

- Review of excavation / backfill steps
- Identification of hazards
- Identification of possible causes of hazards
- Identification of preventative measures
  - Administrative controls
  - Physical barriers

Increase in Probability of a Unit 1 Core Damage Event During Excavation / Backfill

Hazard	Probability of Occurrence During 60 days of Unit 1 Operation	Change in Unit 1 CDF (Per Year)
Construction Mishap Damages Cable Ducts	0.01	3 EE-7
Construction Mishap Damages One SW Line	0.01	1 EE-8
Construction Mishap Damages Two SW Lines	1 EE-6	<3 EE-7
Seismic Event (.18g) Damages Both Cable Ducts	3.4 EE-4	N/C *
Tornado Missile Damages Cable Ducts	1.25 EE-6	<1 EE-9
Tornado Missile Damages One SW Line	1.25 EE-6	<1 EE-9
Tornado Missile Damages Both SW Lines	<1 EE-6	<3 EE-7
Total		<1 EE-6

* N/C - Not Calculated. Temporary seismically qualified supports preclude duct failure.

System Operation Related

Entry into 168-hour Technical Specification Action Statement

Risk Contribution of Operating with One Service Water Header Out of Service

- Change in core damage frequency when in one header operation due to two possible scenarios:
  - Failure of the service water system during an accident
  - Failure of the service water system during normal operation (causing initiating event)

Major Contributors to the Change in Service Water Reliability

Unrelated to Construction Activities

- Non-isolatable piping component rupture
  - Evaluated potential non-isolatable pipe/component ruptures and their affect on core damage frequency (CDF)
  - Evaluated contingency measures and their impact on CDF
- Maintenance activities on power supplies
  - No maintenance will be permitted on key components which support service water system operation during one header operation

System Operation Related

Measures Provided to Minimize Risk

- Alternate supply of water to chillers (from bearing cooling system)
- Alternate supply of cooling water to charging pumps (from primary grade water or fire protection water systems)
- Provisions for emergency repair of service water ruptures
- Administrative controls on maintenance activities

System Operation Related

Increase in Core Damage Frequency Due to Service Water Unavailability

Description	Change in CDF (Per Year)	Change in CD Probability During Six 168-hour LCOs
Service Water System Failure During an Accident	1.0 EE-7	1.2 EE-8
Service Water System As an Initiating Event	4.4 EE-5	5.1 EE-6
Total Changes in CDF	4.4 EE-5	5.1 EE-6 *

* 7.4 EE-7 with countermeasures included

Summary of Risk Assessment Results

Description	Change in CDF (Per Year)
Construction Activities (Excavation / Backfill during Power Operation)	1.0 EE-6
One Train of Service Water System Out of Service for Six 168-hour Action Statements	7.4 EE-7
Bearing Cooling Water Provided to Unit 1 Control Room Chillers	2.0 to 9.0 EE-7 (Preliminary)

Conclusions

Service water preservation project will not have a significant effect on the risk of a core damage event during the project

- The effect of construction mishaps on core damage frequency is negligible with preventive measures implemented
- The effect of the project on core damage frequency due to external events is negligible with seismically qualified supports for the cable duct installed
- Service water isolation to install, relocate, and subsequently remove plugs results in an acceptable increase in core damage frequency. Implementation of additional measures will further reduce core damage frequency