
**BACKGROUND INFORMATION
FOR
AP600
SHUTDOWN
EMERGENCY RESPONSE GUIDELINE**

**SDG-5
AP600 RESPONSE TO COLD OVERPRESSURE
DURING SHUTDOWN**

Rev. 2

July 31, 1996

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TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 INTRODUCTION	1-1
2.0 DESCRIPTION	2-1
3.0 RECOVERY/RESTORATION TECHNIQUE	3-1
3.1 High-Level Action Summary	3-1
3.2 Key Utility Decision Points	3-3
4.0 DETAILED DESCRIPTION OF GUIDELINE	4-1
4.1 Detailed Description of Steps, Notes, and Cautions	4-1
4.2 Step Sequence Requirements	4-8

1.0 INTRODUCTION

Guideline SDG-5, RESPONSE TO COLD OVERPRESSURE DURING SHUTDOWN, is a Shutdown Guideline (SDG) that provides procedural guidance if RCS temperature and pressure are not within the cold overpressure limits during plant shutdown.

There is only one explicit transition to guideline SDG-5. It is from the Shutdown Safety Status Tree, SDF-0.1, on an ORANGE priority when RCS pressure and temperature are not within the cold overpressure limits.

After all the actions in guideline SDG-5 are completed, the operator is instructed to return to the appropriate plant procedure.

2.0 DESCRIPTION

Guideline SDG-5, RESPONSE TO COLD OVERPRESSURE DURING SHUTDOWN, provides actions to respond if RCS temperature and pressure conditions are not within cold overpressure limits during plant shutdown conditions. This guideline is entered on an ORANGE priority from the Shutdown Safety Status Tree if RCS cold overpressure limits are exceeded, as dictated by the RCS pressure-temperature limits within the plant Technical Specifications. Examples of when the cold overpressure limits could be exceeded are from an unintended RCS mass injection, an RCS letdown/RCS makeup flow mismatch, or starting an RCP under water solid RCS conditions with uneven RCS temperatures and no RCPs operating.

The actions of this guideline decrease RCS pressure to within the Technical Specification pressure-temperature limits, checks if all RCPs should be stopped and determines the cause(s) or corrective actions to be taken for the cold overpressure condition.

3.0 RECOVERY/RESTORATION TECHNIQUE

The objective of the recovery/restoration technique incorporated into guideline SDG-5 is to provide actions to respond to an RCS cold overpressure condition.

The following subsections provide a summary of the major action categories of operator actions and the key utility decision points for guideline SDG-5, RESPONSE TO COLD OVERPRESSURE DURING SHUTDOWN.

3.1 High Level Action Summary

A high level summary of the actions performed in SDG-5 is given on the following page in the form of major action categories. These are described below in more detail.

- Depressurize RCS Pressure To Within Technical Specification Pressure - Temperature Limits

Since RCS temperature cannot be changed (increased) rapidly to mitigate a cold overpressure condition, RCS pressure is promptly decreased to mitigate the cold overpressure condition. If the RCS is water solid, RCS pressure is decreased by increasing letdown and decreasing RCS makeup. If a pressurizer steam space is present, auxiliary spray or one set of first stage pressurizer ADS valves is used to depressurize the RCS.

- Check If All RCPs Should Be Stopped

Starting an RCP with uneven RCS temperatures (e.g., a hot SG while remainder of RCS is cold) with a water solid RCS can result in heat addition type cold overpressure events. Also starting an RCP with multiple RCPs operating while the RCS is water solid may result in RCS pressure transients exceeding cold overpressure limits. Therefore if an RCP has just been started which resulted in exceeding the cold overpressure limits, as determined by the Shutdown Safety Status Tree, all RCPS are stopped to stabilize RCS pressure.

- Determine Cause of RCS Pressurization And If Any Additional Actions Are Necessary

The operator is instructed to determine the cause of the RCS pressurization and if any additional actions are necessary to address the abnormal RCS pressure conditions. This information may be needed to determine if the mitigating actions taken were successful.

MAJOR ACTION CATEGORIES IN SDG-5

- Depressurize RCS Pressure To Within Technical Specification Pressure - Temperature Limits
- Check If All RCPs Should Be Stopped
- Determine Cause of RCS Pressurization And If Any Additional Actions Are Necessary

3.2 Key Utility Decision Points

There is one key utility decision point in this guideline when the operator must determine an appropriate course of action. In Step 4, the operator is instructed to determine if any additional actions are necessary to address the abnormal RCS pressure-temperature conditions. The operator will determine if any additional actions are to be taken at this time in the guideline.

4.0 DETAILED DESCRIPTION OF GUIDELINE

This section provides a very detailed discussion of the generic guideline SDG-5 to facilitate EOP writing and training efforts. By presenting guideline background information in greater detail through the use of a structured format (i.e., step description tables, step sequence tables, and logic diagrams), applicability can be more easily determined. The separate and unique subsections containing this information follow.

4.1 Detailed Description of Steps, Notes, and Cautions

This section contains a one-page (or more) step description table for each separate guideline step, note, and caution. Notes and cautions are always presented relative to the step they precede.

The Step Description Tables for the steps and associated notes and cautions of guideline SDG-5 are presented on the following page.

STEP 1

STEP: Decrease RCS Pressure To Within Tech Spec Pressure-Temperature Limits

PURPOSE: To decrease RCS pressure to within Technical Specification pressure-temperature limits

BASIS:

Since RCS temperature cannot be changed rapidly (without generating excessive thermal stresses) to correct for the cold overpressure condition, RCS pressure is lowered to the appropriate Technical Specification pressure-temperature condition based on the prevailing RCS cold leg temperature. RCS cold leg temperature is used for this purpose since the critical/limiting component being protected is the reactor vessel belt line region walls, which see downcomer or cold leg fluid temperatures.

ACTIONS:

- Determine if RCS is water solid
- Decrease RCS pressure by increasing letdown and decreasing RCS makeup
- Decrease RCS pressure by using auxiliary spray
- Decrease RCS pressure by using one set of first stage PRZR ADS valves

INSTRUMENTATION:

- PRZR level indication
- CVS letdown flow indication
- RCS makeup flow indication
- RCS cold leg temperature indication
- RCS pressure indication
- Auxiliary spray status indication
- PRZR first stage ADS valves status indication

CONTROL/EQUIPMENT:

Controls for:

- CVS letdown
- RCS makeup
- Auxiliary spray
- PRZR first stage ADS valves

KNOWLEDGE:

N/A

ADDITIONAL INFORMATION:

N/A

STEP 2

STEP: Check If All RCPs Should Be Stopped

PURPOSE: To instruct the operator to stop all RCPs if an RCP has just been started with a water solid RCS resulting in a cold overpressure condition

BASIS:

Starting an RCP with uneven RCS temperatures (e.g., a hot SG while remainder of RCS is cold) with a water solid RCS can result in heat addition type cold overpressure events. Also starting an RCP with multiple RCPs operating while the RCS is water solid may result in RCS pressure transients exceeding cold overpressure limits. Therefore if an RCP has just been started which resulted in exceeding the cold overpressure limits, as determined by the Shutdown Safety Status Tree, all RCPs are stopped to stabilize RCS pressure.

ACTIONS:

- Determine if an RCP has just been started with a water solid RCS
- Stop all RCPs

INSTRUMENTATION:

RCP operating status indication

CONTROL/EQUIPMENT:

RCP controls

KNOWLEDGE:

N/A

ADDITIONAL INFORMATION:

N/A

STEP 3

STEP: Determine Cause Of RCS Pressurization

PURPOSE: To instruct the operator to determine the cause of the RCS pressurization resulting in a cold overpressure condition

BASIS:

Cold overpressure events are caused by an inadvertent RCS pressurization as opposed to rapid temperature changes. The root cause of RCS pressurization is determined so that the operator can determine if additional actions are needed as instructed in the next step.

ACTIONS:

Determine cause of inadvertent RCS pressurization

INSTRUMENTATION:

N/A

CONTROL/EQUIPMENT:

N/A

KNOWLEDGE:

N/A

ADDITIONAL INFORMATION:

N/A

STEP 4

STEP: Determine If Additional Corrective Actions Are Necessary

PURPOSE: To determine if any additional corrective actions are necessary to address the cause for the cold overpressure condition

BASIS:

This step instructs the operator to determine if any additional corrective actions are necessary for addressing the cause of the cold overpressure condition. The operator is responsible for providing any further actions to address the cause of the cold overpressure condition, if appropriate.

ACTIONS:

Determine if any additional corrective actions are necessary to address the cause of the cold overpressure condition.

INSTRUMENTATION:

N/A

CONTROL/EQUIPMENT:

N/A

KNOWLEDGE:

If the RNS relief valve had opened to limit any overpressurization, the operator should verify that it has properly reseated once pressure is below its lifting pressure

ADDITIONAL INFORMATION:

N/A

STEP 5

STEP: Go To Appropriate Plant Procedure

PURPOSE: To direct the operator to the proper procedure following completion of the steps in this guideline

BASIS:

Now that the guideline steps have been completed, the operator should continue plant operation and/or recovery by going to the appropriate normal or abnormal plant procedure.

ACTIONS:

Go to appropriate plant procedure

INSTRUMENTATION:

N/A

CONTROL/EQUIPMENT:

N/A

KNOWLEDGE:

N/A

ADDITIONAL INFORMATION:

N/A

4.2 Step Sequence Requirements

This section consists of a table which presents the existing guideline sequence and identifies the interchangeability of guideline steps for the benefit of the EOP writer.

The Step Sequence Table for SDG-5 is provided on the following page. The interchangeability of guideline steps is identified by the numbers in the column to the right of each guideline step.

STEP SEQUENCE FOR SDG-5

<u>STEP</u>	<u>SEQUENCE</u>
1. Decrease RCS Pressure To Within Tech Spec Pressure-Temperature Limits	1
2. Check If All RCPs Should Be Stopped	2
3. Determine Cause Of RCS Pressurization	3
4. Determine If Additional Corrective Actions Are Necessary	4
5. Go To Appropriate Plant Procedure	5