# 10.0 STEAM AND POWER CONVERSION

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# 10.0 STEAM AND POWER CONVERSION

## 10.1 SUMMARY DESCRIPTION

This section of the DCD is incorporated with the following departure(s) and/or supplement(s).

### 10.1.3 COMBINED LICENSE INFORMATION ON EROSION-CORROSION MONITORING

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Replace the existing paragraph with the following new subsections:

#### 10.1.3.1 Erosion – Corrosion Monitoring Program

STD COL 10.1-1 Erosion-corrosion or flow-assisted corrosion (FAC) leads to wall thinning of steel piping exposed to flowing water or wet steam. The metal loss from plant components and system piping is a complex interplay of many parameters such as water chemistry, material composition, and hydrodynamics. Carbon steel piping components that carry wet steam are especially susceptible to erosion-corrosion and represent an industry wide problem. As a result of several erosion-corrosion failures throughout the nuclear industry the NRC issued guidance that resulted in the final issue of Generic Letter 89-08.

The Erosion-Corrosion Monitoring Program analyzes, inspects, monitors and trends those nuclear power plant components that are potentially susceptible to erosion-corrosion damage. In addition, the Erosion-Corrosion Monitoring Program considers the information of Generic letter 89-08 and industry guidelines.

##### 10.1.3.1.1 Analysis

There are several thousand piping components in a typical nuclear power plant that are potentially susceptible to erosion-corrosion damage. The erosion-corrosion analysis is performed using an industry sponsored computer program to identify the most susceptible components, thereby reducing the number of inspections. Each susceptible component is tracked in a database and is inspected, based on susceptibility. Analytical methods utilize the results of plant specific inspection data to develop plant specific correction factors. This correction accounts for uncertainties in plant data, and for systematic discrepancies caused by plant operation. For each piping component, the analytical method predicts the wear rate, and the estimated time until it must be re-inspected, repaired, or replaced. Carbon steel piping (ASME III and B31.1) that is used for single or multi-phase high temperature flow are the most susceptible to erosion-corrosion damage and receive the most critical analysis. An industry-sponsored computer program developed for nuclear and fossil power plant applications is used to evaluate the rate of wall thinning for components and piping potentially susceptible to erosion-corrosion.

10.1.3.1.2 Industry Experience

Review and incorporation of industry experience provides a valuable supplement to plant analysis and associated inspections and provides additional inspection locations and increased or decreased inspection intervals for system components and piping. Industry experience is used for procedure development and update, and is also used to update the computer program by identifying susceptible components or piping features.

10.1.3.1.3 Inspections

Good inspections are the foundation of an effective program. Wall thickness measurements establish the extent of wear in a given component, provide data to help evaluate trends, and provide data to refine the predictive model. Thorough inspections are the key to fulfilling these needs. Components can be inspected for wear using ultrasonic techniques (UT), radiography techniques (RT), or by visual observation. Both UT and RT methods can be used to investigate whether or not wear is present. The initial inspections are used as a baseline for later inspections. Each subsequent inspection determines the wear rate for the piping and components and the need for inspection frequency adjustment for those components.



10.1.3.1.4 Training and Engineering Judgement

The Erosion-Corrosion Monitoring Program coordinator for the plant receives both Introductory and Advanced Erosion-Corrosion training. The backup coordinator has at least the Introductory Erosion-Corrosion training. Task specific training is provided for plant personnel that are relied on to implement the comprehensive Erosion-Corrosion Monitoring Program.

Inspection data must be evaluated to determine its acceptability. The purpose of evaluating the inspection data is to determine the location, extent, and the amount of total wear for each inspected component. Problems that occur during the inspection process are: unknown initial wall thickness, inaccuracies in NDE measurements, data recording errors, obstructions that prevent complete gridding, etc. Uniform evaluation methods and the utilization of engineering judgment in the review of inspection data provides enhanced data inputs to the computer program. The Advanced Erosion-Corrosion training program provides the criteria for this engineering evaluation.

10.1.3.1.5 Long-Term Strategy

The establishment and implementation of a long-term strategy is essential to the success of a plant program. This strategy focuses on reducing wear rates and performing inspections on the most susceptible locations. Monitoring of components is crucial to preventing failures.

10.1.3.2 Procedures

The erosion-corrosion program is governed by procedure. This procedure contains the following elements:

- A requirement to monitor and control erosion-corrosion
- Identification of the tasks to be performed and associated responsibilities
- Identification of the position that has overall responsibility for the erosion-corrosion program at each plant
- Communication requirements between the coordinator and other departments that have responsibility for performing support tasks
- Quality Assurance requirements
- Identification of long-term goals and strategies for reducing high erosion-corrosion wear rates.
- A method for evaluating plant performance against long-term goals.

The erosion-corrosion implementing procedures provide guidelines for controlling the major task. The plant procedures for major tasks are as follows:

- Identifying susceptible systems
- Performing erosion-corrosion analysis
- Selecting and scheduling components for initial inspection
- Performing inspections
- Evaluating degraded components
- Repairing and replacing components when necessary
- Selecting and scheduling locations for the follow-on inspections
- Collection and storage of inspections records

10.1.3.3 Plant Chemistry

The Erosion-Corrosion Monitoring Program may be affected by system chemistry. The responsibility for system chemistry is under the purview of plant chemistry section. The plant chemistry section specifies chemical addition in accordance with plant procedures. The plant chemistry section routes procedures for the affected systems to the Erosion-Corrosion Monitoring Program coordinator for review and evaluation.

## 10.2 TURBINE-GENERATOR

This section of the DCD is incorporated with the following departure(s) and/or supplement(s).

### 10.2.2 SYSTEM DESCRIPTION

In the second paragraph, after the fourth sentence ending in "... or components", add the following new statement:

STD SUP Subsection 3.5.1.3 addresses the probability of generation of a turbine missile for a pair of AP 1000 plants side by side.

### 10.2.6 COMBINED LICENSE INFORMATION ON TURBINE MAINTENANCE AND INSPECTION

STD COL 10.2-1 This section is modified as identified in the DCD markup section of APP-GW-GLR-021, Rev 0 (TR06), AP1000 As-Built COL Information Items.

## 10.3 MAIN STEAM SUPPLY SYSTEM

This section of the DCD is incorporated with the following departure(s) and/or supplement(s).

### 10.3.2.2.1 Main Steam Piping

Add the following new paragraph at the end of the subsection:

STD SUP Operating and maintenance procedures include adequate precautions to avoid water (steam) hammer and relief valve discharge loads and alert personnel to the potential for and means to minimize water (steam) hammer occurrences.

### 10.3.5.4 Chemical Addition

Add the following new paragraph at the end of the subsection:

STD SUP An alkaline chemistry supports maintaining iodine compounds in their nonvolatile form; when iodine is in its elemental form it is volatile and it is also free to react with organic compounds to create organic iodine compounds which are not assumed to remain in solution. It is noted that no significant level of organic compounds is expected in the secondary system. The secondary water chemistry thus does not directly impact the radioactive iodine partition coefficients.

## 10.4 OTHER FEATURES OF STEAM AND POWER CONVERSION SYSTEM

This section of the DCD is incorporated with the following departure(s) and/or supplement(s).

### 10.4.5 CIRCULATING WATER SYSTEM

BLN COL 10.4-1 This section is still under development.

#### 10.4.7.2.1 General Description

BLN COL 10.4-2 The DCD statement in the sixth paragraph, last sentence:

"The oxygen scavenger agent and pH control agent will be selected by the Combined License applicant."

is replaced with the following new statements:

"The oxygen scavenger agent is hydrazine and the pH control agent is ammonia/ monoethylamine. During shutdown conditions, carbohydride may be used in place of hydrazine."

STD SUP Add the following new paragraph at the end of the subsection:

Operating and maintenance procedures ensure adequate precautions to avoid steam/water hammer occurrences.

#### 10.4.11.2.2 System Operation

BLN COL 10.4-3 In the Potable Water System Chemistry Control subsection, the DCD statement:

"A biocide is injected into the raw water supply to the potable water system upstream of the potable water storage tank."

is replaced with the following new statement:

"The biocide, sodium hypochlorite, is injected into the raw water supply to the potable water system upstream of the potable water storage tank."

## 10.4.12 COMBINED LICENSE INFORMATION

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Replace the existing paragraph with the following new statement:

BLN COL 10.4-1 This COL item is addressed in Section 10.4.5.

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Replace the existing paragraph with the following new statement:

BLN COL 10.4-2 This COL item is addressed in Section 10.4.7.2.1.

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Replace the existing paragraph with the following new statement:

BLN COL 10.4-3 This COL item is addressed in Section 10.4.11.2.2.

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