Docket File

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

December 23, 1992

Docket No. 52-001

APPLICANT: GE Nuclear Energy Company (GE)

PROJECT: Advanced Boiling Water Reactor (ABWR)

SUBJECT: SUMMARY OF MEETING WITH GE ON DECEMBER 15, 1992

A public meeting was held between the Nuclear Regulatory Commission (NRC) staff and GE Nuclear Energy (GE) at the NRC office in Rockville, Maryland, on December 15, 1992. The purpose of this meeting was to discuss issues related to the industry and staff review of the ABWR inspections, tests, analyses, and acceptance criteria (ITAAC). Enclosure 1 is a list of those who attended, Enclosure 2 contains the viewgraphs presented at the meeting, and Enclosure 3 contains GE's markups to the ITAAC for several systems of the ABWR.

GE opened the meeting by presenting a short summary of the progress of the development of the ITAAC. The nature of the changes to the Tier 1 material were discussed; however, no conclusions were reached on the material. The staff will evaluate the changes as part of the resolution of open items in the draft final safety evaluation report (DFSER) for the ABWR. GE will provide the related Tier 1 material to the NRC in conjunction with these open items. GE will include in the submittal their responses to the staff's comments provided in a letter of August 12, 1992, pertaining to the Tier 1 design certification material (Stage 3).

The staff proposed to send a multi-disciplined team to GE to review the proposed markups to the ITAAC, and tentatively projected this to occur during the week of January 10-15, 1993. This effort and the further development of the ITAAC will be discussed at the next senior management meeting with GE on January 21, 1993.

The staff reiterated that the Commission's metric policy should be implemented for all federal publications. This means that the Tier 1 material for the ABWR should specify metric units with english units in parentheses.

The staff expressed its concerns over the treatment of motor-operated and power-operated valves in the Tier 1 material. The staff indicated that the concerns of Generic Letter 89-10, up to and including supplement 4, needed to be addressed appropriately by GE. An approach was discussed whereby GE would identify the safety functions of important valves, and specify the testing requirements applicable to the ITAAC. This issue required parallel resolution in the standard safety analysis report as well.

The staff commented that the main steamline material in the ITAAC appeared not to address the agreements reached previously that the main steamline would meet the seismic and stress requirements necessary to address radiological release considerations, not merely maintain leak tightness. GE stated that they would correct the apparent inconsistency to appropriately reflect the design commitments needed for not having a main steamline leakage control system.

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The use of boilerplate ITAAC entries to verify particular aspects of the design were discussed. GE agreed to provide these to the staff prior to the review team going to GE in January 1993.

The requirements for interfaces were discussed. The staff reiterated the requirements of 10 CFR Part 52 for GE. The staff emphasized that only site-specific features should be true interfaces, and that it was the responsibility of the combined license (COL) applicant to propose the details of meeting these in the COL application.

(Original signed by)

Thomas H. Boyce, Project Manager
Standardization Project Directorate
Associate Directorate for Advanced Reactors
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Enclosures:
As stated

cc w/enclosures:
See next page

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with changes.

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GE ABWR ITAAC MEETING

DECEMBER 15, 1992

NAME	ORGANIZATION
William Russell	NRR/ADT
Jerry Wilson	NRR/ADAR/PDST
Mike Finkelstein	OGC/H&E/Advanced Reactors
Tom Boyce	NRR/ADAR/PDST
Conrad McCracken	NRR/ADT/SPLB
Jim Lyons	NRR/ADT/DSSA
William Burton	NRR/ADT/DSSA
Goutam Bagchi	NRR/ADT/DET
Chet Poslusny	NRR/ADAR/PDST
Bob Pierson	NRR/ADAR/PDST
Adrian Heymer	NUMARC
Steve Franz	GE
Tony James	GE

Enclosure 1

ISSUES DISCUSSED/RAISED AT THE 12/8-12/10 PLANT SYSTEMS BRANCH MEETINGS

ISSUE		STATUS
RELATIONSHIP OF TIER 1/ITAAC TO SAR DESIGN ISSUES	GE:	TIER 1/ITAAC CAN ONLY BE WRITTEN AFTER SAR ISSUES RESOLVED; I.E., ITAAC IS NOT A VEHICLE FOR ISSUE RESOLUTION
	STAFF:	CONCUR
DESCRIPTION OF ANALYSES CALLED FOR BY ITAAC	GE:	DESCRIPTION CAN BE IN EITHER ITAAC TABLE OR SAR
	STAFF:	CONCUR
LEVEL OF DETAIL IN TIER 1	GE:	GRADED APPROACH AS DISCUSSED AND AGREED TO OVER THE LAST TWELVE MONTHS
	STAFF:	NEEDS FURTHER DISCUSSION
TREATMENT OF 89-10 THROUGH SUPPLEMENT 4	GE:	NOT FULLY RESOLVED AT THE SSAR LEVEL, THUS TIER 1 COMMITMENTS NOT FINALIZED. LIMITED MOV TESTING COMMITMENTS (RCIC, RWCU)
	STAFF:	NEEDS FURTHER DISCUSSION

Enclosure 2

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ISSUES DISCUSSED/RAISED AT THE 12/8-12/10 PLANT SYSTEMS BRANCH MEETINGS

ISSUE		STATUS
SYSTEM SCOPE DEFINITION	GE:	CURRENT LEVEL OF DEFINITION IN TIER 1 FUNCTIONAL DIAGRAM IS SUFFICIENT
	STAFF:	CONCUR, BUT THINK SOME FINE-TUNING IS NEEDED CASE-BY-CASE (CLEAR DEFINITION OF SYSTEM BOUNDARIES)
UNITS	GE:	SAR, TIER 1 MKS METRIC
	STAFF:	WANTS DUAL UNITS BUT UNDERSTAND, ACCEPT GE APPROACH
ANALYSIS ISSUE ON 2.10.1 ITEM 2 (APPLIES TO PIPING DAC ALSO)	GE:	CRISP ACCEPTANCE CRITERIA
	STAFF:	LOOKING FOR TECHNICAL DEFINITION OF ACCEPTANCE CRITERIA
USE OF ASME N STAMP AS ACCEPTANCE CRITERION	GE:	FULLY ACCEPTABLE CONCEPT
	STAFF:	PROCESS NOT HARDWARE-ORIENTED

AJJ 2
12/15/92

2. MS Piping from the seismic restraint to the condenser inlet including drain pipe is analyzed to demonstrate leak-tightness under SSE loading conditions.	2. Perform analysis	2 Verify analysis performed.

ISSUES DISCUSSED/RAISED AT THE 12/8-12/10 PLANT SYSTEMS BRANCH MEETINGS

ISSUE	STATUS
COMPONENT TESTING -- HOW MUCH IN ITAAC?	GE: CASE-BY-CASE TREATMENT OF KEY ITEMS; I.E., NOT COMPREHENSIVE STAFF: NEEDS FURTHER DISCUSSION BY MECHANICAL PEOPLE
DRAINS ADDED TO DESIGN CERTIFICATION SCOPE	GE: NEEDS A TIER 1 ENTRY (NEW ITEM) STAFF: -
BOILERPLATE ITEMS	GE: / STAFF: IT WOULD BE MORE EFFICIENT IF THERE COULD BE A ONE-SHOT SIGNOFF OF A SET OF STANDARDIZED ITAAC TABLE ENTRIES
PHYSICAL VS. MECHANICAL SEPARATION	GE: USE PHYSICAL. BASIS: WORD USED IN REGULATIONS; MORE DESCRIPTIVE (NOTE: NOT IMPLEMENTED 100%) STAFF: CONCUR

3

AJJ
12/15/92

ISSUES DISCUSSED/RAISED AT THE 12/8-12/10 PLANT SYSTEMS BRANCH MEETINGS

ISSUE	STATUS
EQ	GE: {ON HOLD STAFF:
INTERFACE ITAAC	GE: A) PROPOSING THE COL APPLICANT SAR STRATEGY - NEEDS STAFF REVIEW B) CONTENTS NEED FURTHER DEVELOPMENT STAFF: A) - B) CONCUR
HOW TO HANDLE: 1) ASME CODE CLASS, 2) QUALITY GROUP, 3) SAFETY CLASS IN TIER 1	GE: 1) CODE CLASS ON FUNCTIONAL DIAGRAMS; NO DIRECT ITAAC ENTRY 2) QUALITY GROUP (USUALLY) IN TEXT; NO DIRECT ITAAC ENTRY 3) SAFETY CLASS NOT ADDRESSED IN TIER 1 STAFF: REVIEWING THE ISSUE

AJJ 4
12/15/92

ISSUES DISCUSSED/RAISED AT THE 12/8-12/10 PLANT SYSTEMS BRANCH MEETINGS

ISSUE		STATUS
BACKFLOW PROTECTION	GE:	SAR/DESIGN ISSUE. ITAAC TO BE USED (IF APPROPRIATE) TO VERIFY DESIGN FEATURE(S) IN PLACE
	STAFF:	CONCUR
ENVIRONMENTAL SEPARATION	GE:	VERIFIED BY BUILDING ARRANGEMENT AND HVAC CONFIGURATION ITAAC. NO SEPARATE ITAAC REQUIRED
	STAFF:	CONCUR (?)
ELECTRICAL SEPARATION	GE:	ISSUE PART OF THE GENERIC ITAAC DISCUSSIONS
	STAFF:	-

AJJ 5
12/15/92

ABWR DESIGN CERTIFICATION

WHAT WILL IT TAKE TO CLOSE OUT TIER 1?

1. CLOSE OUT SAR DESIGN ISSUES

2. RESOLVE GENERIC ISSUES APPROACH

3. GE PROVIDE MARKUPS

   - DESIGN DESCRIPTION
   - ITAAC TABLES
   - RESPONSES TO NRC QUESTIONS

4. SCHEDULE LONG, HARD, GRIND-IT-OUT MEETINGS WITH FULL-TIME ATTENDANCE

   - KNOWLEDGEABLE ENGINEERS

   - PART 52, TIER 1, ITAAC EXPERTS

NO EASY WAY TO DO IT

AJJ 6
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ENVIRONMENTAL QUALIFICATION OF ABWR MSIV ACTUATOR

DEFINITION OF CONDITIONS - SPEC

OPERATING TIME	-	TWO ENTRIES
TEMPERATURE	-	PROFILE, 10+ ENTRIES
PRESSURE	-	PROFILE, 10+ ENTRIES
HUMIDITY	-	ONE ENTRY
RADIATION	-	TABULAR ENTRIES
AGING	-	TABULAR ENTRIES
DYNAMIC LOADS	-	TIMES AND CYCLES PLUS 4 PAGES RRS

10-15 PAGES OF DETAILED

TECHNICAL INFORMATION

OTHER ISSUES

SOME INPUT DATA DESIGN-DEPENDENT

TESTING METHODOLOGIES DESIGN/MATERIALS DEPENDENT

ENVIRONMENTAL QUALIFICATION OF ABWR MSIV ACTUATOR

TEST SEQUENCE

INSPECTION/BASELINE TEST

NORMAL RADIATION AGING

FUNCTIONAL TEST

THERMAL AGING

FUNCTIONAL TEST

MECHANICAL AGING

FUNCTIONAL TEST

DBE RADIATION

FUNCTIONAL TEST

DYNAMIC/SEISMIC

FUNCTIONAL TEST

DBE - POST DBE

FUNCTIONAL TEST

DISASSEMBLY/INSPECTION

\# UNDERLINED SECTIONS - TITLE ONLY, NO TIER 1 ENTRY.
✓ REVIEWED BY NUMARC GROUP.
* DELETION APPROVED

Table of Contents

ABWR DESIGN CERTIFICATION
10/23/92 GE/NRC ABWR REVIEW

NUMARC ITAAC REVIEW: OVERVIEW OF CHANGES

- STANDARDIZED ENTRIES FOR SIMILAR SYSTEM
  - CONFIGURATION
  - HYDRO TEST
  - CONTROL ROOM FEATURES
  - REMOTE SHUTDOWN INTERFACE
  - POWER SUPPLIES
  - MECHANICAL SEPARATION
- MODIFICATION OF ACCEPTANCE CRITERIA CONSIDERED TOO IMPRECISE OR AMBIGUOUS
- DELETION OF SELECTED SYSTEMS NOT MERITING TIER 1 TREATMENT (SERVICING, CHEMICAL SYSTEMS)
- DELETED DIRECT TIER 1 REFERENCES TO CODES AND STANDARDS (EXCEPT ASME)
- CERTAIN GENERIC ISSUES PUT ON HOLD PENDING FURTHER NUMARC/NRC DISCUSSIONS
  - EQUIPMENT QUALIFICATION
  - MOTOR-OPERATED VALVES
  - INSTRUMENT SETPOINTS
  - EMI/RFI/SWC
  - SEISMIC QUALIFICATION
  - WELDING
  - ELECTRICAL SEPARATION
  - BUILDING DIMENSIONS

ABWR DESIGN CERTIFICATION
10/23/92 GE/NRC ABWR REVIEW

NUMARC ITAAC REVIEW: OVERVIEW OF CHANGES

TRENDS

SAFETY RELATED SYSTEMS	:	SAME OR MORE ITAAC ENTRIES WORKING MORE PRECISE
NON-SAFETY RELATED SYSTEMS	:	LESS ITAAC BUT MORE FOCUSED ON ISSUES OF SAFETY SIGNIFICANCE
MINOR SYSTEMS	:	DELETED
GENERIC ISSUES	:	ON HOLD

ABWR DESIGN CERTIFICATION
10/23/92 GE/NRC ABWR REVIEW

NUMARC ITAAC REVIEW: LESSONS LEARNED

- o TIER 1 PREPARATION REQUIRES CONSIDERATION OF TECHNICAL AND LEGAL ISSUES
  - CAREFUL WORDING
- o TIMELY DEFINITION OF TIER 1 REQUIRES:
  - ONE-ON-ONE TECHNICAL INTERACTIONS
  - CONTINUOUS MANAGERIAL INVOLVEMENT
  - SOME PARTICIPANTS FAMILIAR WITH PART 52
- o IMPORTANT TO HAVE A STYLE GUIDE AND TRAINING SESSIONS
  - MULTIPLE AUTHOR CONSISTENCY
  - STANDARD SET OF DEFINITIONS
- o PREPARERS AND REVIEWERS NEED TO UNDERSTAND THE "60 YEAR" SIGNIFICANCE OF TIER 1 ENTRIES
  - FLEXIBILITY IMPORTANT AND LEGITIMATE IN SOME AREAS
- o DEFINING PRECISE, UNAMBIGUOUS ITAAC FOR GENERIC ISSUES IS A REAL CHALLENGE
- o INITIAL SAR PREPARATION SHOULD RECOGNIZE THE SIGNIFICANCE OF TIERED DESIGN CERTIFICATION
  - RETROFIT SITUATION FOR ABWR

ABWR DESIGN CERTIFICATION
10/23/92 GE/NRC ABWR REVIEW

NUMARC ITAAC REVIEW: EXAMPLES OF REVISED MATERIAL

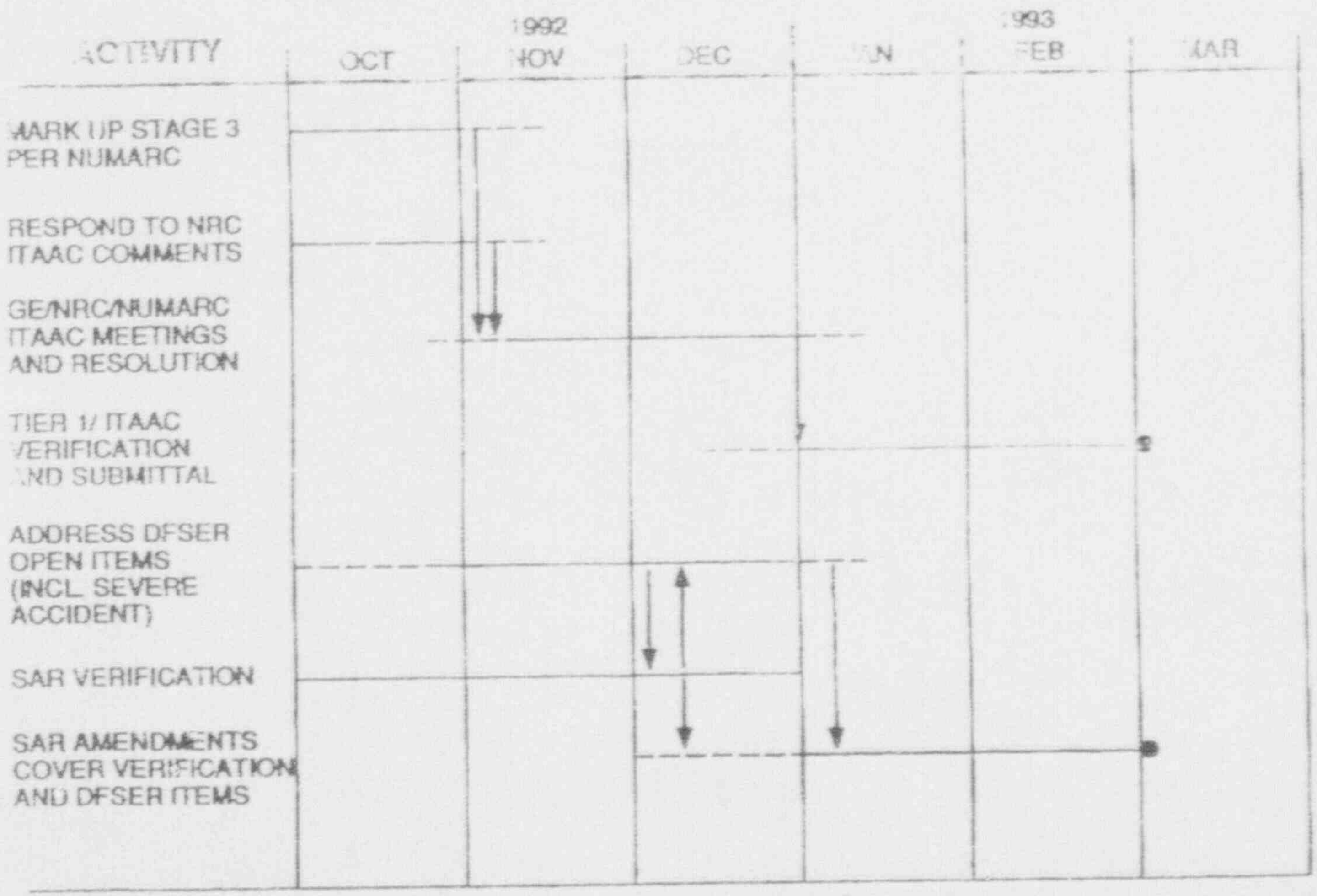
- STANDBY LIQUID CONTROL SYSTEM
- CONTROL BUILDING
- FEEDWATER CONTROL SYSTEM
- ELECTRICAL POWER DISTRIBUTION SYSTEM

ABWR DESIGN CERTIFICATION

10/23/92 GE/NRC ABWR REVIEW

ROPOSED TIER [illegible] ITAAC [illegible]

ABWR TIER I AND SAR SUBMITTAL SCHEDULES



ABWR DESIGN CERTIFICATION

10/23/92 GE/NRC ABWR REVIEW

PRIORITY LIST FOR EARLY NOVEMBER NRC DISCUSSIONS

RPV AND INTERNALS

SLCS

RPS

RHR

RWCU

CIRCULATING WATER

RBCWS

EMERGENCY D-G

CONTROL BULDING

PIPING DAC

SITE PARAMETERS

GENERIC ITEMS ON HOLD

SEPARATE GE/NRC INTERACTIONS ON HFE AND SOFTWARE DAC

ABWR DESIGN CERTIFICATION
10/23/92 GE/NRC ABWR REVIEW

SUMMARY

o GE/NRC MUST INITIATE INTENSIVE SYSTEM-BY-SYSTEM REVIEW OF TIER 1 ENTRIES

  - LINE-BY-LINE REVIEWS; TAKE AS LONG AS IS NEEDED

  - USE STAGE 3 MARKUPS

  - NOVEMBER, DECEMBER 1992

  - WDC OR SAN JOSE

  - NEED FULL-TIME MANAGEMENT PARTICIPATION

o ABWR TIER 1 SCHEDULES INFLUENCED BY NUMARC/NRC RESOLUTION OF GENERIC ISSUES

o TARGET IS TO SUBMIT AGREED-TO VERIFIED ABWR TIER 1 BY 2/28/92

ABWR DESIGN CERTIFICATION

10/23/92 GE/NRC ABWR REVIEW

TREATMENT OF GENERIC ISSUES
INDUSTRY VIEW

SUMMARY:

TIER 2 MECHANISMS (NOT TIER 1 ITAAC) SHOULD BE USED FOR VERIFYING CERTAIN GENERIC ISSUES

BACKGROUND:

52.47 CALLS FOR SUBMITTAL OF AN SAR COMPARABLE TO A PART 50 FSAR

52.47 CALLS FOR ITAAC TO CONFIRM AS-BUILT IS IN ACCORDANCE WITH DESIGN CERTIFICATION

- o NOT EVERY ISSUE IN THE SAR NEED BE THE SUBJECT OF AN ITAAC
- o TWO TIERED DESIGN CERTIFICATION IS ACCEPTED (2/15/91 SRM)
- o IMPLEMENTATION OF TIER 1 IS VERIFIED BY ITAAC
- o IMPLEMENTATION OF TIER 2 IS VERIFIED BY THE QA PLAN CALLED FOR BY PARTS 52/50
- o IDEA OF A DISCIPLINED SIGN-AS-YOU-GO PROGRAM TO CONFIRM IMPLEMENTATION OF LICENSEE COMMITMENTS IS GENERALLY ACCEPTED

ABWR DESIGN CERTIFICATION
10/23/92 GE/NRC ABWR REVIEW

TREATMENT OF GENERIC ISSUES (CONT.)

CONCLUSION:

QA PLAN PLUS SIGN-AS-YOU-GO CAN BE USED TO VERIFY GENERIC ISSUES

PLANT SYSTEMS BRANCH COMMENTS

2.10.1 TURBINE MAIN STEAM SYSTEM

COMMENT ID: SPLB-2.10.1-1

List all loads served by the MS system (e.g. SJAE) and system layout (e.g. flow restrictors and MSIVs)

GE RESPONSE:

Comment rejected.

Beyond the scope of TIER 1 / ITAAC.

COMMENT ID: SPLB-2.10.1-2

Discuss MSIV's ability to shut during maximum DP and flow conditions

GE RESPONSE:

Comment rejected.

Not practical to test MSIVs for closure speed against maximum differential pressure and maximum flow. Closure times are expected to be faster under maximum dP and flow because upstream pressure tends to seat the valve (i.e. the disk is on the upstream side of the valve seat).

The stroke time of the valves will be tested. However, stroke rate testing of MSIVs against high pressure steam cannot occur until start-up.

COMMENT ID: SPLB-2.10.1-3

Identify seismic interface restraint

GE RESPONSE:

Comment accepted.

The seismic interface restraint is shown on Figure 2.1.2b "Steamline" in the NBS ITAAC.

COMMENT ID: SPLB-2.10.1-4

PLANT SYSTEMS BRANCH COMMENTS

Identify seismic class and quality group (including nitrogen accumulators for MSIVs and safety/relief valves and system branch lines)

GE RESPONSE:

Comment partially accepted.

The Seismic Class and Quality Group of the of the MSLs within the reactor building is discussed in the "Design Description" section of the NBS ITAAC.

The Seismic Class and Quality Group of the pneumatic supply lines for the MSIVs and SRVs is not discussed in the NBS ITAAC.

COMMENT ID: SPLB-2.10.1-5

Discuss features to protect MS line from water entrainment

GE RESPONSE:

Comment rejected. No changes will be made to the NBS ITAAC as a result of this comment.

The MSLs have drain lines to drain the MSLs during startup, before full power operation.

The steam separator / steam dryer inside the RPV prevent moisture carryover during normal power operation. Also, the MSLs are insulated to limit the generation of condensate.

Closure of the turbine stop valves on RPV high water level 8 initiates a reactor scram. This limits moisture carryover when the steam separators are flooded.

COMMENT ID: SPLB-2.10.1-6

State that the shutoff valves will close in 2 seconds

GE RESPONSE:

PLANT SYSTEMS BRANCH COMMENTS

2.10.2 CONDENSATE FEEDWATER AND CONDENSATE AIR EXTRACTION SYSTEMS

This section discusses 2 systems; the Condensate and Feedwater System (CFS) and the Main Condenser Evacuation System (MCES).

CONDENSATE AND FEEDWATER SYSTEM

COMMENT ID: **SPLB-2.10.2-1**

Provide drawing

GE RESPONSE:

Not appropriate for Tier 1 material.

COMMENT ID: **SPLB-2.10.2-2**

Identify all cooling loads (e.g. offgas, SJAE, gland steam)

GE RESPONSE:

Not appropriate for Tier 1 material.

COMMENT ID: **SPLB-2.10.2-3**

Discuss isolation provisions and supporting instrumentation

GE RESPONSE:

This topic applicable to Nuclear Boiler System, Section 2.1.2.

COMMENT ID: **SPLB-2.10.2-4**

Discuss power supply for remote shutoff valve

GE RESPONSE:

This topic applicable to Nuclear Boiler System, Section 2.1.2.

COMMENT ID: **SPLB-2.10.2-5**

Identify seismic interface restraint

GE RESPONSE:

This topic applicable to Nuclear Boiler System, Section 2.1.2.

MAIN CONDENSER EVACUATION SYSTEM

COMMENT ID: SPLB-2.10.2-6

State that the system is designed for hydrogen

GE RESPONSE:

This will be included in Design Description.

COMMENT ID: SPLB-2.10.2-7

It is not clear that the flow instrument shown on the diagram is what is used for isolation of offgas on low flow

GE RESPONSE:

Flow element is shown at inlet to 2d stage ejector and discussed in Design Description.

COMMENT ID: SPLB-2.10.2-8

Identify functions of the pressure instrumentation

GE RESPONSE:

Will clarify Design Description to show that pressure indicator indicates operability.

COMMENT ID: SPLB-2.10.2-9

Indicate that the mechanical vacuum pump trips on high main steam line radiation

GE RESPONSE:

This is discussed in Design Description and ITAAC.

PLANT SYSTEMS BRANCH COMMENTS

COMMENT ID: SPLB-2.10.2-10

Include the fact that hydrogen in the dilution stream is kept below 4% by volume

GE RESPONSE:

Too detailed for Tier 1. No action taken.

COMMENT ID: SPLB-2.10.2-11

Show the hydrogen analyzers on the drawing

GE RESPONSE:

This level of detail is not appropriate for Tier 1 material.

2.10.4 CONDENSATE PURIFICATION SYSTEM

COMMENT ID: SPLB-2.10.4-1

SPLB has no responsibility for this system and should be removed as the primary review branch

GE RESPONSE

No GE action.

2.10.7 MAIN TURBINE

COMMENT ID: SPLB-2.10.7-1

Clarify which valves trip and which modulate

GE RESPONSE:

Will add to Design Description "MSVs and CIVs trip and CVs modulate".

COMMENT ID: SPLB-2.10.7-2

Discuss hydrogen-protection features on the generator

GE RESPONSE:

Not appropriate for Tier 1 material.

2.10.9 TURBINE GLAND STEAM SYSTEM

COMMENT ID: SPLB-2.10.9-1

Provide a drawing

GE RESPONSE:

A simplified SSAR drawing (10.4.2) will be provided.

COMMENT ID: SPLB-2.10.9-2

Include the blower exhaust rad monitor on the drawing

GE RESPONSE:

This will be included on simplified SSAR drawing provided for comment SPLB-2.10.9-2.

COMMENT ID: SPLB-2.10.9-3

Clarify steam sources (auxiliary steam, main steam, process steam from high-pressure heater drain tank vent header)

GE RESPONSE:

This will be clarified on simplified SSAR drawing provided for comment SPLB-2.10.9-2.

COMMENT ID: SPLB-2.10.9-4

Identify the cooling source for the condenser

GE RESPONSE:

This will be included on simplified SSAR drawing provided for comment SPLB-2.10.9-2.

COMMENT ID: SPLB-2.10.9-5

Clarify how the steam source is changed on high radiation. Is it done manually or automatically?

GE RESPONSE:

Too detailed for Tier 1 material and site specific.

COMMENT ID: SPLB-2.10.9-6

Include the fact that the system provides sealing steam for the turbine stop and control valves and the combined intermediate valves

GE RESPONSE:

This will be included on simplified SSAR drawing provided for comment SPLB-2.10.9-2.

2.10.13 TURBINE BYPASS SYSTEM

COMMENT ID: SPLB-2.10.13-1

Include statement that system can accommodate a full-load rejection without lifting main steam safety/relief valves

GE RESPONSE:

No. SRVs will lift on full load rejection.

COMMENT ID: SPLB-2.10.13-2

Identify that turbine bypass valves (TBVs) close on loss of vacuum, LOSP, and loss of hydraulic pressure

GE RESPONSE:

This will be added to Design Description.

COMMENT ID: SPLB-2.10.13-3

State in description (and test) that valves open when steam pressure exceeds preset pressure

GE RESPONSE:

This will be added to Design Description.

COMMENT ID: SPLB-2.10.13-4

Include drawing

GE RESPONSE:

Not necessary - refer to 2.10.1 schematic.

COMMENT ID: SPLB-2.10.13-5

Ensure that all the high-energy lines associated with this system are located in the Turbine Bldg (Turbine Bldg ITAAC)

GE RESPONSE:

OK - In Turbine Building ITAAC.

COMMENT ID: SPLB-2.10.13-6

State that piping up to and including the TBVs are seismic Category 1 and Safety Class 2 and that remainder of piping up to the condenser can withstand an SSE

GE RESPONSE:

No - This piping is not safety-related.

2.10.21 MAIN CONDENSER

COMMENT ID: SPLB-2.10.21-1

Include drawing

GE RESPONSE:

Too detailed - Not required in any SSAR (or Tier 1 material).

COMMENT ID: SPLB-2.10.21-2

PLANT SYSTEMS BRANCH COMMENTS

Include important instrumentation on drawing (conductivity, vacuum monitor, rad monitor)

GE RESPONSE:

No - This in in Design Description.

COMMENT ID: SPLB-2.10.21-3

List all connections to condenser

GE RESPONSE:

This is not appropriate for Tier 1 material.

COMMENT ID: SPLB-2.10.21-4

Include fact that system receives and collects condensate flows, removes air and noncondensables, and removes hydrogen and oxygen

GE RESPONSE:

This is included in Design Description.

COMMENT ID: SPLB-2.10.21-5

Include 4 minute cond..nsate retention capability

GE RESPONSE:

This is in Design Description.

COMMENT ID: SPLB-2.10.21-6

Include fact that maximum flood level is less than grade if condensate system should fail.

GE RESPONSE:

The CWS System, 2.10.23, is flood limiting - clarify.

2.10.23 CIRCULATING WATER

PLANT SYSTEMS BRANCH COMMENTS

COMMENT ID: SPLB-2.10.23-1

Indicate that system dumps heat to the power cycle heat sink.

GE RESPONSE:

COMMENT ID: SPLB-2.10.23-2

Where will the level switches be shown (the Turbine Bldg ITAAC)?

GE RESPONSE:

COMMENT ID: SPLB-2.10.23-3

Indicate and show that the logic scheme minimizes potential for spurious "high level system" isolation trips

GE RESPONSE:

Not Tier 1. This level of detail not appropriate for Tier 1 material.

COMMENT ID: SPLB-2.10.23-4

State that there will be features provided to prevent organic fouling

GE RESPONSE:

Not Tier 1. This level of detail not appropriate for Tier 1 material.

COMMENT ID: SPLB-2.10.23-5

Identify that the system will function on low level in the power cycle heat sink

GE RESPONSE:

Not Tier 1. This level of detail not appropriate for Tier 1 material.

PLANT SYSTEMS BRANCH COMMENTS

COMMENT ID: SPLB-2.10.23-6

Include the fact that features are provided to maintain a minimum circulating water temperature

GE RESPONSE:

Not Tier 1. This level of detail not appropriate for Tier 1 material.

COMMENT ID: SPLB-2.10.23-7

Ensure that all Turbine Building flooding will be confined to the condenser pit (Turbine Building ITAAC)

GE RESPONSE:

See Turbine Building Section 2.15.11.

Comment ID — Comment/GE Response

COMMENT ID: DET-2.10.1-1

2.10.1 Turbine Main Steam System

The ABWR plant design has eliminated the main steam isolation valve leakage control system. Instead, GE proposes to rely on the use of an alternate leakage path which takes advantage of the large volume and surface area in the main steam piping, by-pass line, and condenser to hold up and plate out the release of fission products following core damage. Therefore, these components are used to mitigate the consequences of an accident and are required to remain functional during and after a safe shutdown earthquake. The commitments that GE has made relative to this issue are in Section 3.2 of the SSAR and are summarized in Section 3.2.1 of the staff's Final Safety Evaluation Report for the ABWR. The discussion in Section 2.10.1 and the ITAAC in Table 2.10.1 should be revised to reflect this information and to confirm that it has been implemented in accordance with the SSAR commitments.

GE RESPONSE:

See response to Radiation Protection Branch comment RPB-2.10.1-1.

COMMENT ID: DET-2.10.4-1

2.10.4 Condensate Purification System

The proposed Certified Design Commitment and ITAAC do not address the primary function of the system and how to verify its operability. GE should revise the ITAAC accordingly. See comments on attached marked-up page.

GE RESPONSE:

GE will delete reference to water treatment additions since there may be several, depending on final detailed material selection, e.g. O_2, H_2, Fe, etc.

12/8/92

RADIATION PROTECTION BRANCH COMMENTS

RADIATION PROTECTION BRANCH COMMENTS

1. Section 2.10.1 Turbine Main Steam System

COMMENT ID: RPB-2.10.1-1

The staff has reviewed Section 2.10.1, Turbine Main Steam System in the Tier 1 Design Certification Material (TDCM) and finds that the design description and its related ITAAC (Table 2.10.1) should include (1) the operability requirement of main steam drain valve from main control room via essential power supply (Class IE), (2) the structural integrity requirement for main steam lines, drain lines, and main condenser for their leak-tightness following a postulated LOCA.

GE RESPONSE:

COMMENT ID: RPB-2.10.1-2

The main steam lines from MSIV to the main condenser, including the drain lines, should be analyzed, and (3) using a seismic analysis to demonstrate appropriate structural integrity for leak-tightness under SSE loading conditions. The staff has provided a credit for iodine removal in the main steam lines, drain lines, and condenser following a postulated LOCA and accepted the ABWR design without a MSIV leakage control system. This is Open Item 2.3.6-1.

GE RESPONSE:

RADIATION PROTECTION BRANCH COMMENTS

3.0 Section 2.10.1, Turbine Main Steam System

COMMENT ID: RPB-2.10.1-3

3.1 Add the following two certified design commitments in Table 2.10.1 as ITAAC items.

(l) the main steam drain valves are operable from the main control room via essential power supply (class IE).

(2) the main steam piping from MSIV to the condenser inlet including the main steam drain pipe is analyzed to demonstrate appropriate leaktightness under SSE loading conditions.

3.2 The basis for adding the above ITAAC items are that (l) the staff has provided a credit for airborne radioactive iodine removal in the main steam (and drain) piping and in the main condenser following a postulated LOCA, and (2) the staff accepted the ABWR design without a MSIV leakage control system.

3.3 A marked-up copy of Section 2.10.1 is enclosed.
Incorporates comment 3.1

GE RESPONSE:

Agree to add.

ACRS COMMENTS

COMMENT ID: ACRS

2.10.2-1 Section 2.10.2. page -1 thru -5 (6/1/92)

Condensate and Feedwater System, Design Description, Page 2.10.2-1, Paragraph, Last Sentence, states:

This portion of the piping is analyzed for dynamic effects from postulated events and safety/relief valve discharges.

Table 2.10.2a, Inspections, Tests, Analyses and Acceptance Criteria, Page 2.10.2-4, doesn't explicitly provide verification that this analysis has been performed. (Perhaps Certified Design Commitment number 1 was intended to imply this verification; however, that commitment could be met without coverage of the analysis mentioned here.)

GE RESPONSE:

This sentence deleted. The referenced piping applies to NBS.

COMMENT ID: ACRS

2.10.2-2 Section 2.10.2, page -1 thru -5 (6/1/92)

Main Condenser Evacuation System, Design Description, Page 2.10.2-2, Third Paragraph, states:

The MCE System is designed to Quality Group D.

Table 3.0, Page -5, the entry for 2.10.2 shows 3.3 Piping Design as not applicable. Quality Group D requires piping designed to B31.1 .

GE RESPONSE:

Section 3.3 Piping Design is not applicable to non-safety-related Quality Group D. No change.

ACRS COMMENTS

COMMENT ID: ACRS

2.10.4-1 Section 2.10.4, page -1 and -2 (6/1/92)

Design Description. Page 2.10.4 -1. Third Paragraph, states:

The CP System is designed to Quality Group D.

Table 3.0, Page -5, the entry for 2.10.4 shows 3.3 Piping Design as not applicable. Quality Group D requires piping designed to B31.1 .

GE RESPONSE:

Section 3.3 Piping Design is not applicable to non-safety-related Quality Group D. No change.

ACRS COMMENTS

COMMENT ID: ACRS

2.10.7-1 Section 2.10.7, page -1 and -2 (6/1/92)

Page 2.10.7-2, Table 2.10.7, ITAAC doesn't include any coverage of verification that LP rotors have been center-bored. See David A. Ward's letter to James M. Taylor of April 13, 1992, Item 6 on page 4.

GE RESPONSE:

Too detailed for Tier 1. Center boring LP rotors is dependent on available technology and should be at the discretion of vendor and customer. No action taken.

COMMENT ID: ACRS

2.10.7-2 Section 2.10.7, page -1 and -2 (6/1/92)

Section 2.10.7 barely mentioned the Turbine Controls. Yet Section 10.2.8, Turbine Controls, says that the topic is covered in Section 2.10.7. Figure 2.2.7a Reactor Protection System, on Page 2.2.7-8, provides a block ("C71 RPS") of four (4) input signal from turbine I&C. The RPS ITAAC don't include verification of the I&C for these turbine inputs. Coverage is required somewhere.

GE RESPONSE:

The RPS ITAAC includes input signals from Turbine Controls. ITAAC 2.2.7, item 3, simulation testing will verify that I&C provides signal to RPS.

12/8/92

ACRS COMMENTS

COMMENT ID: ACRS

2.10.9-1 Section 2.10.9, page -1 and -2 (6/1/92)

Design Description, Page 2.10.9-1, Fourth Paragraph, states:

The TGS System is designed to Quality Group D.

Table 3.0, Page -5, the entry for 2.10.9 shows 3.3 Piping Design as not applicable. Quality Group D requires piping designed to B31.1.

Further, *Design Description*, Page 2.10.9-1, Last Paragraph, states:

Relief valves on the seal steam header prevent excessive seal steam pressure.

This also involves "piping design."

GE RESPONSE:

Section 3.3 Piping Design is not applicable to non-safety-related Quality Group D. No change.

ACRS COMMENTS

COMMENT ID: ACRS

2.10.13-1 Section 2.10.13, page -1 and -2 (6/1/92)

The failure or malfunction of the Turbine Bypass System has the potential to cause severe transients effects on the Reactor Coolant System. The coverage in Section 2.10.13 doesn't appear consistent with that importance.

Design Description, Page 2.10.13-1, Fourth Paragraph, Last Sentence, and last Paragraph, state respectively:

> The TB System is designed to bypass nominally 33% of the rated main steam flow to the condenser.
>
> The TB System in conjunction with the reactor systems, provides the capability to shed 40% of the turbine-generator rated load without reactor trip.

These important capabilities are no doubt assumed in various transient analyses and should be confirmed by the ITAAC.

GE RESPONSE:

Too detailed for Tier 1. In addition the TBS is not safety-related.

Last page

Mr. C. Poslusny 11-H-3
U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, DC 20555

2.10 Power Cycle

2.10.1 Turbine Main Steam System

Design Description

The Main Steam (MS) System (Figure 2.10.1) supplies steam generated in the reactor to the turbine. This Tier 1 entry addresses that portion of the MS System that ranges between, ~~but does not include, the outermost containment isolation valves and the turbine stop valves.~~ but does not include, the seismic restraint downstream or the outermost containment isolation valves and the turbine stop valves.

The MS System is not required to effect or support safe shutdown of the reactor or to perform in the operation of rector safety features; however, the MS System is designed:

(1) To ~~comply with applicable codes and standards in order to~~ accommodate operational stresses such as internal pressure and dynamic loads without ~~risk of~~ failures, ~~and consequential releases of radioactivity in excess of the established regulatory limits.~~

(2) ~~To accommodate normal and abnormal environmental limits.~~ Provide a leakage path to the main condensers under seismic conditions.

~~(3) To assure that failures of non Seismic Category I equipment or structures, or pipe cracks or breaks in high or moderate piping in the MS will not preclude functioning of safety related equipment or structures in the plant.~~

(3) With suitable access to permit in-service testing and inspections.

The MS System main steam piping consists of four lines from the seismic restraint ~~outboard main steamline isolation valves~~ to the main turbine stop valves. The header arrangement upstream of the turbine stop valves allows them to be tested on-line with minimum load reduction and also supplies steam to the power cycle auxiliaries, as required.

The MS System is quality group D not safety related.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.10.1 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria which sill be undertaken for the MS System.

Table 2.10.1: Main Steam System

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
~~1. Failures of non-Seismic Category I equipment or structures, or pipe cracks or breaks in high or moderate piping in the MS System will not preclude functioning of safety-related equipment or structures in the plant.~~	~~1. Visual inspection of the MS System will be performed.~~	~~1. No safety-related systems or structures are in the vicinity or are protected from failures in the nonseismic portions of the MS System.~~
~~2. Access is provided for in-service testing and inspections.~~	~~2. Visual inspection of the MS System will be performed.~~	~~2. Confirmation that required in-service inspections can be accomplished.~~
1. A simplified configuration for the MS System is described in Section 2.10.1	1. Construction records will be reviewed and visual inspections will be conducted for the configuration of the MS System	1. The as-built configuration of the MS System is in accordance with the description in Section 2.10.1
2. MS Piping from the seismic restraint to the condenser inlet including drain pipe is analyzed to demonstrate leak-tightness under SSE loading conditions.	2. Perform analysis	2. Verify analysis performed.

reference piping DAC?

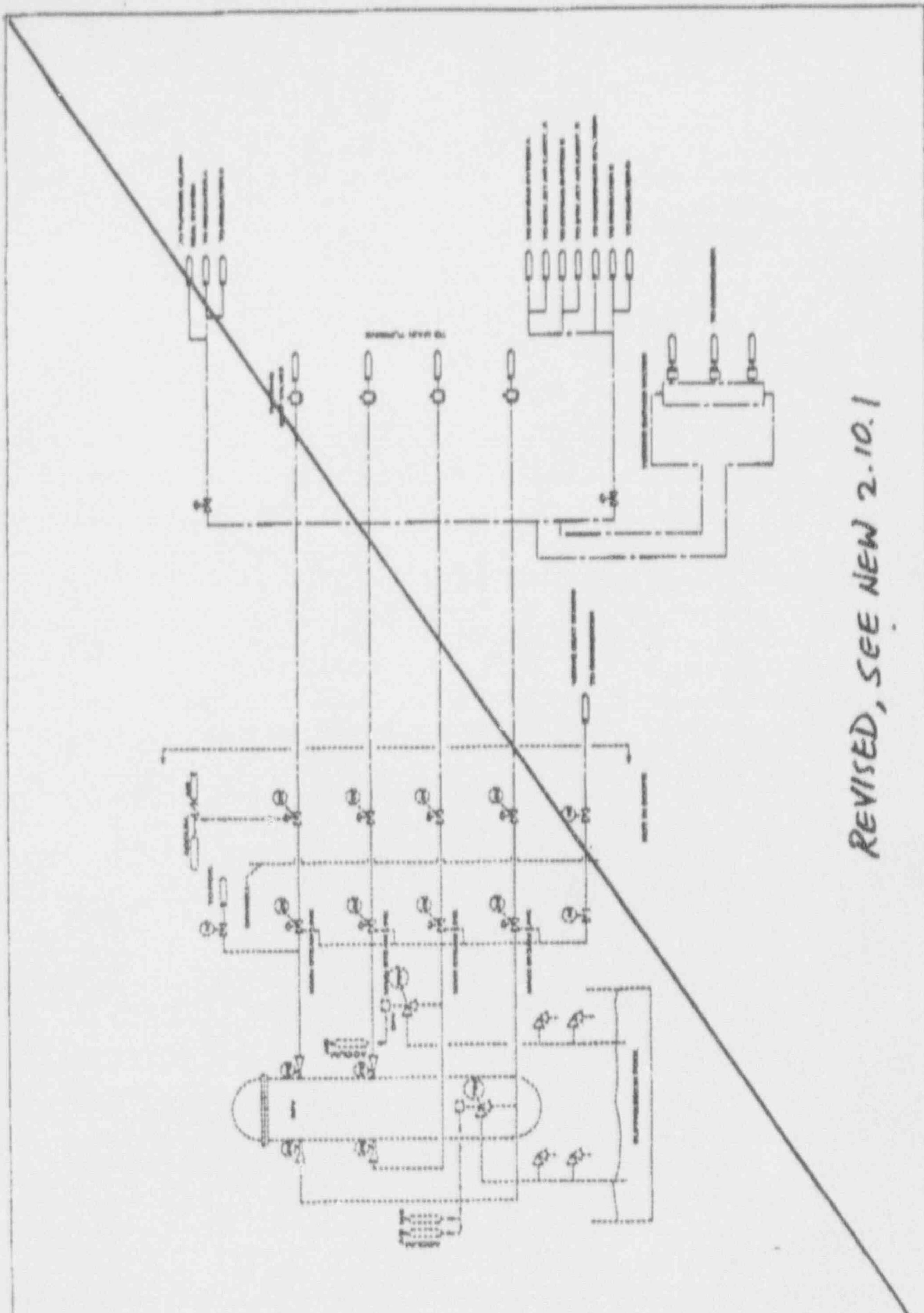


Figure 2.10.1 Main Steam System

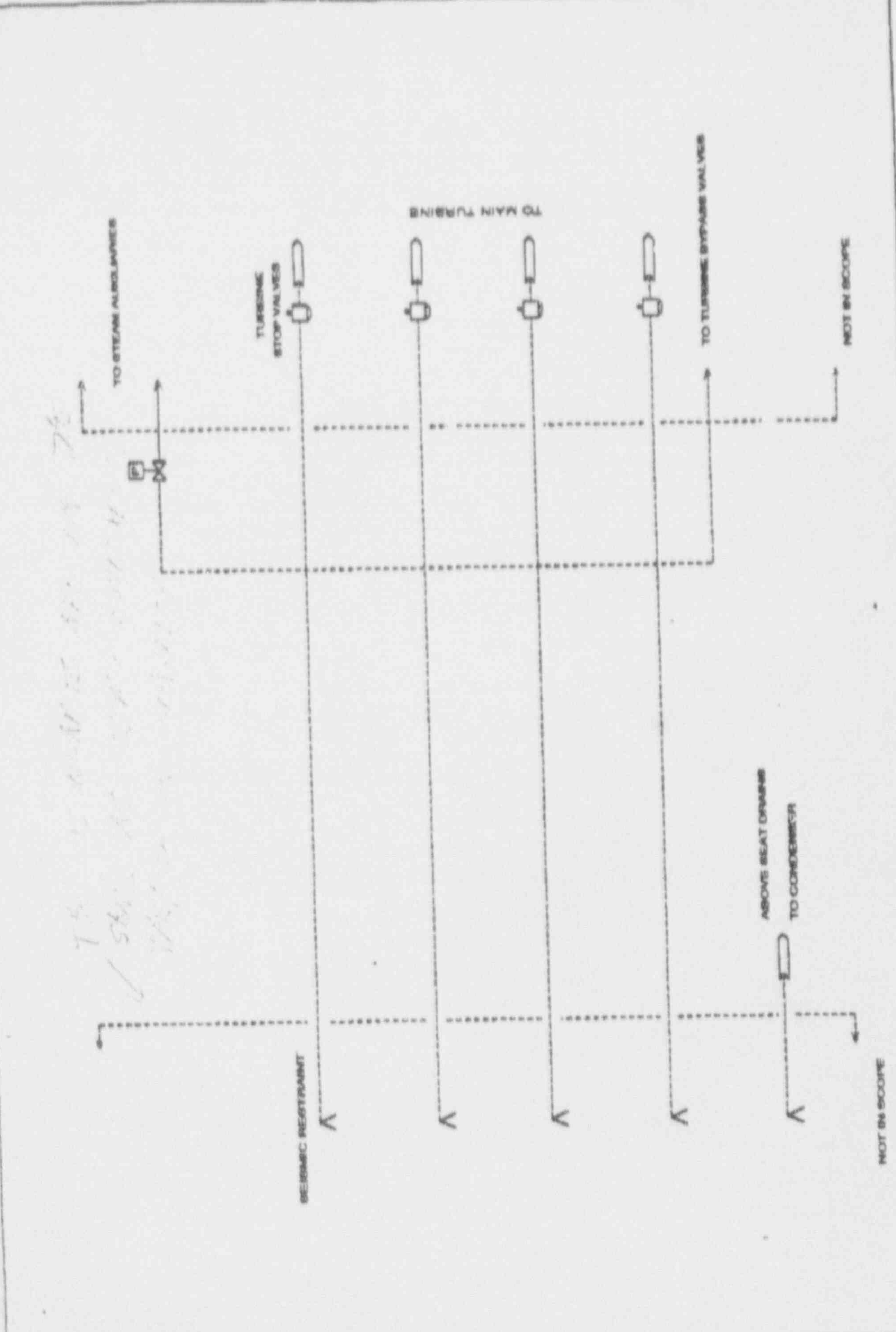


Figure 2.10.1 Turbine Main Steam System

2.10.2 Condensate Feedwater and Condensate Air Extraction System

The Condensate Feedwater and Condensate Air Extraction System (CFDWA) consists of two subsystems, the Condensate and Feedwater (CF) System and the Main Condenser Evacuation System (MCES).

Condensate and Feedwater System

Design Description

The function of the Condensate and Feedwater (CF) (Figure 2.10.2a) System is to receive condensate from the condenser hotwells, supply condensate to the cleanup system, and deliver high purity feedwater to the reactor, at the required flow rate, pressure and temperature. Condensate is pumped from the main condenser hotwell by the condensate pumps, passes through the feedwater heaters to the feedwater pumps, and then is pumped through the high pressure heaters to the nuclear Steam Supply System.

The CF System boundaries considered here extend from the main condenser outlet to (but not including) the second isolation valve seismic restraint outside the containment and downstream of the outermost isolation valve. The CF System consists of the piping, valves, heat exchangers, controls and instrumentation, and the associated equipment and subsystems which supply the reactor with heated feedwater in a closed steam cycle utilizing regenerative feedwater heating.

The CF System does not serve or support any safety function and has no safety design basis. System analyses show that failure of this system cannot compromise any safety-related systems or prevent safe shutdown.

The CF System is designed to quality Group D non-safety related.

Portions of the system that are radioactive during operation are shielded with access control for inspections.

Leakage is minimized with welded construction used wherever practicable.

Relief discharges and operating vents are channeled through closed systems.

Operational system redundancy is provided with respect to feedwater heaters, pumps, or control valves by using multi-string arrangements and provisions for isolating and bypassing equipment and sections of the system.

The majority of the condensate and feedwater piping considered in this section is located within the turbine building which contains no safety-related equipment or systems. The portion which connects to the second isolation valve outside the containment is located in the steam tunnel between the turbine and

reactor buildings. This portion of the piping is analyzed for dynamic effects from postulated events and safety/relief valve discharges.

The entire system piping is analyzed for waterhammer loads that could potentially result from anticipated flow transients.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.10.2a provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria which will be undertaken for the CF System.

Main Condenser Evacuation System

Design Description

Noncondensable gases are removed from the power cycle by tThe Main Condenser Evacuation (MCE) System (Figure 2.10.2b). The MCE System removes the hydrogen and oxygen produced by the radiolysis of water in the reactor, and other power cycle noncondensable gases, and exhausts them to the offgas system during plant power operation, and to the turbine building compartment exhaust system at the beginning of each startup.

The MCE System does not serve or support any safety function and has no safety design basis.

The MCE System is designed to Quality Group D. Non-Safety Related

The MCE System consists of two 100% capacity, double stage, of redundant steam jet air ejectors (SJAE) units (complete with intercondenser) for power plant operation, and a mechanical vacuum pump for use during startup. The last stage of the SJAE unit is normally in operation and the other is on standby.

Steam supply to the second stage ejector SJAE is maintained at a minimum specified flow rate to ensure adequate dilution of the hydrogen and prevent the offgas from reaching the flammable limit of hydrogen.

Steam pressure and flow is continuously monitored and controlled in the ejector steam supply lines. Redundant pressure controllers sense steam pressure at the second stage inlet and modulate the steam supply control valves upstream of the air ejectors. The steam flow transmitters provide inputs to logic devices. These logic devices provide for isolating the offgas flow from the air ejector unit on a two out of three logic, sShould the steam flow drop below acceptable limits for offgas stream dilution. the Off-gas System will be isolated.

The vacuum pump exhaust stream is discharged to the turbine building compartment exhaust system which provides for radiation monitoring of the

system effluents prior to their release to the monitored vent stack and the atmosphere.

The vacuum pump is tripped and its discharge valve is closed upon receiving a main steam high-high radiation signal.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.10.2b provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria which will be undertaken for the MCE System.

Table 2.10.2a: Condensate and Feedwater System

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The CF System will be analyzed to show that system failure will not compromise plant safety.	1. Review failure analysis design assumptions with respect to as-built condition.	1. As-built conditions are same as the design assumptions used in the analysis.
2. The CF System will be provided with shielding and access control.	2. Visual inspection of the CF System will be performed.	2. The as-built CF System provides shielding and access control.
3. CF System leakage will be minimized by use of welded construction wherever practicable.	3. Visual inspection of the CF System will be performed.	3. Welded construction utilized as designed.
4. CF System relief valve discharges and operating vents will be channeled through closed systems.	4. Visual inspection of the CF System will be performed.	4. Relief valve discharges and operating vent lines are routed as required by certified design.
5. The CF System will operate with a feedwater heater, pump or control valve out of service.	5. Simulated signals to verify operational status maintained.	5. The CF System remains operational.
6. Failures of nonseismic Category I equipment or structures, or pipe cracks and breaks in high- or moderate piping in the CF System will not preclude functioning of safety-related equipment or structures in the plant.	6. Visual inspection of the CF System will be performed.	6. No safety-related systems or structures are in the vicinity or are protected from failure in the nonseismic portions of the CF System.
7. The CF System will be analyzed for potential waterhammer loads.	7. Review waterhammer analysis design assumptions with respect to as-built condition.	7. As-built conditions are same as the design assumptions used in the analysis.

Table 2.10.1a: Condensate and Feedwater System

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A simplified configuration for the CF System is described in section 2.10.2.	1. Construction records will be reviewed and visual inspections will be conducted for the configuration of the CF System.	1. The as-built configuration of the CF System is in accordance with the description in Section 2.10.2.

Table 2.10.2b: Main Condenser Evacuation System

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
~~1. The off-gas will be prevented from reaching a flammable limit of hydrogen.~~	~~1. Tests will be conducted using simulated signals to the SJAE flow control system.~~	~~1. Confirmation that the system isolates before flammability limits are reached.~~
1. On low steam flow Off-gas System isolates.	1. Tests will be conducted using simulated signals for low steam flow	1. Isolation valve closes on receipt of simulated signal.
~~2. Radioactive releases will be maintained within established limits.~~	~~2. Tests will be conducted using simulated signals to the vacuum pump isolation system.~~	~~2. Confirmation that the system isolates as required to limit releases.~~
2. On high radiation signal vacuum pump trips and discharge valve closes.	2. Tests will be conducted using simulated signals for high radiation	2. Vacuum pump trips and discharge valve closes.
3. A simplified configuration for the MCE System is described in Section 2.10.2.	3. Construction records will be reviewed and visual inspections will be conducted for the configuration of the MCE System.	3. The as-built configuration of the MCE System is in accordance with the description in Section 2.10.2.

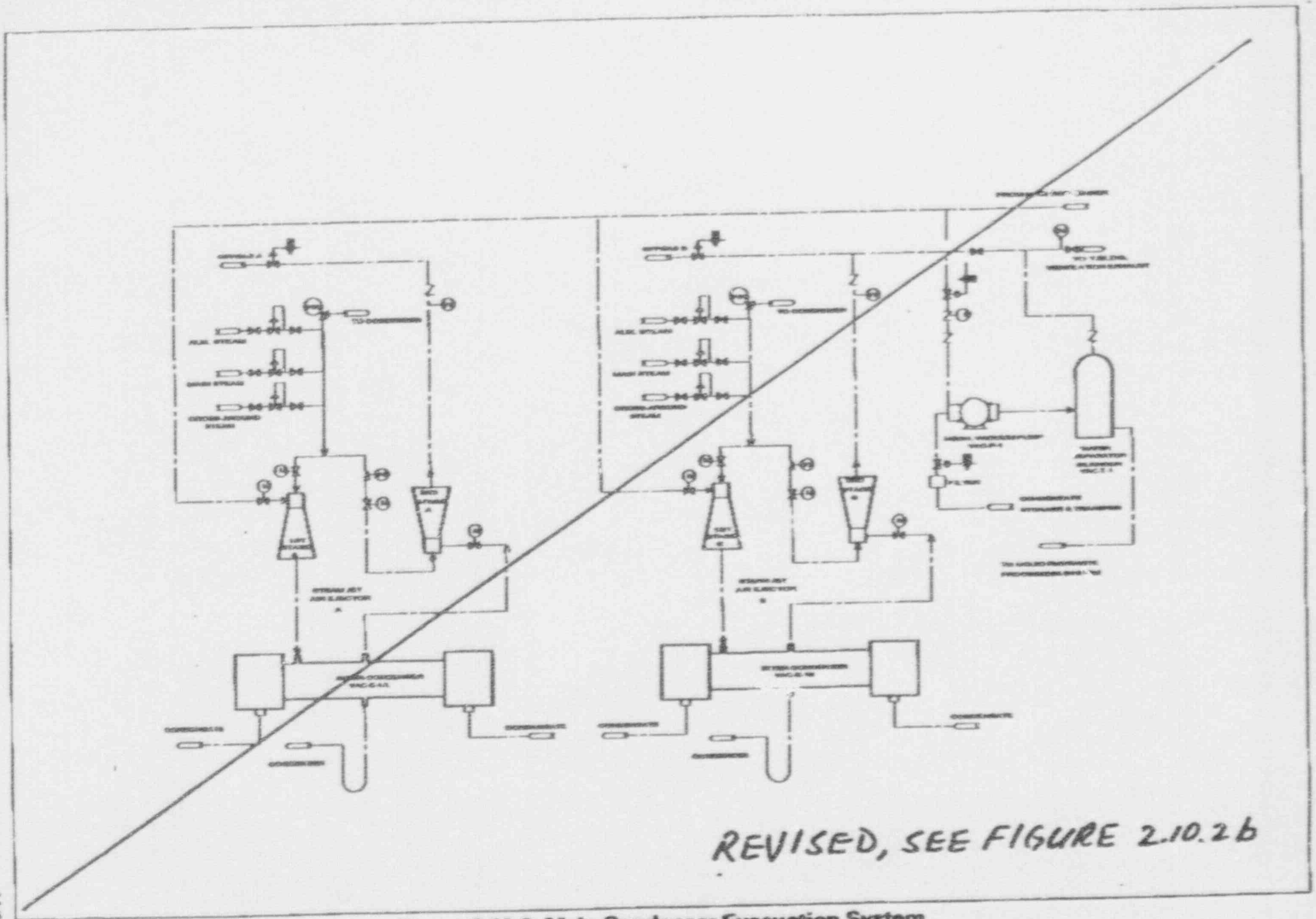


Figure 2.10.2 Main Condenser Evacuation System

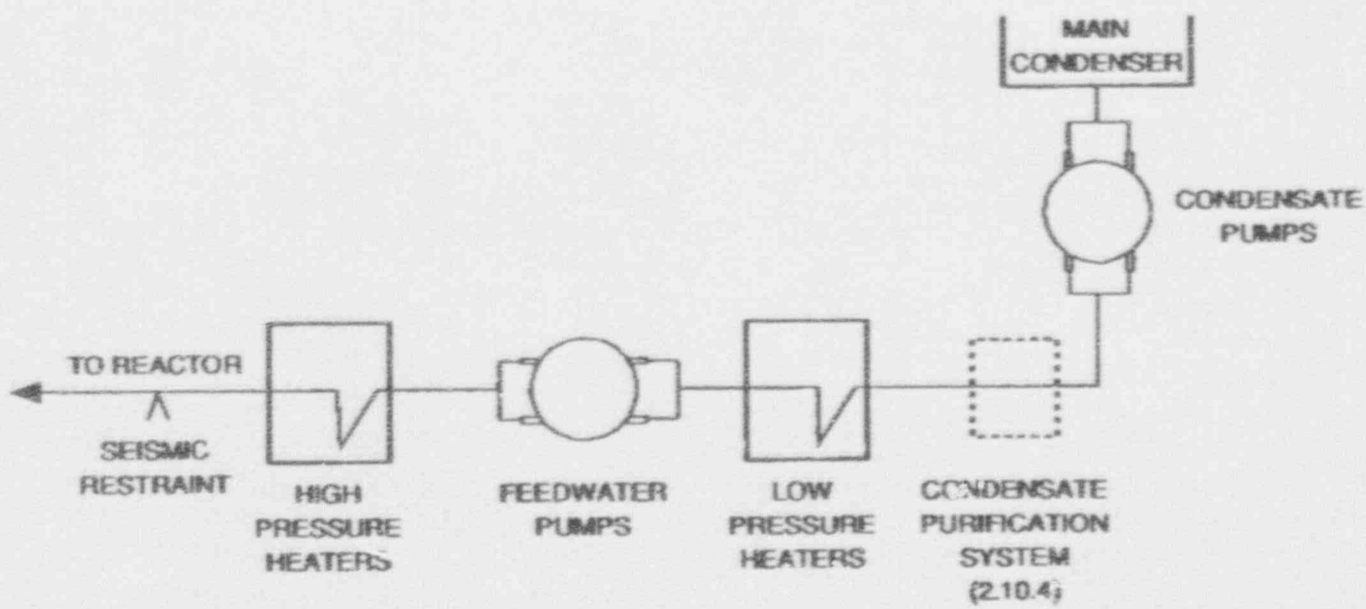


Figure 2.10.2a Condensate and Feedwater System

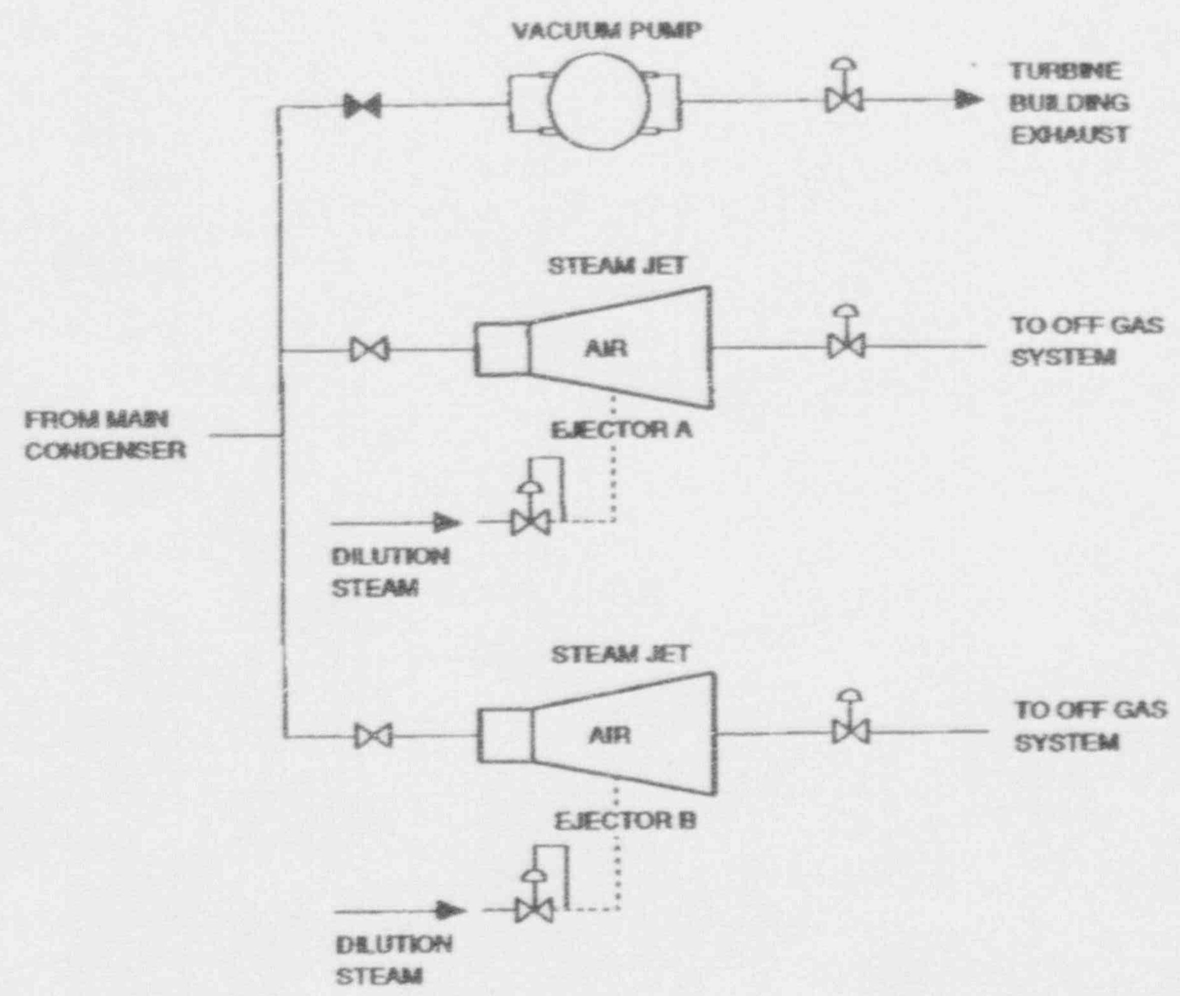


Figure 2.10.2b Main Condenser Evacuation System

2.10.4 Condensate Purification System

Design Description

The Condensate Purification (CP) System purifies and treats the condensate ~~as required~~ to maintain reactor feedwater purity, using filtration to remove insoluble solids ~~corrosion products~~, ion exchange to remove soluble solids from condenser leakage and other impurities, and water treatment additions to ~~minimize~~ reduce corrosion/erosion releases in the power cycle.

The CP System does not serve or support any safety function and has no safety design basis.

The CP System is designed to Quality Group D non-safety-related standards.

The CP System consists of full flow high efficiency particulate filters followed by full flow deep bed demineralizers.

~~Shielding is provided for the CP System.~~

Vent gases and other wastes from the CP System are collected in radiation controlled areas and sent to the radwaste system for treatment and/or disposal.

The CP System is located in the ~~t~~Turbine ~~b~~Building~~, and piping or equipment failures will not affect plant safety~~.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.10.4 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria which will be undertaken for the CP System.

Table 2.10.4: Condensate Purification System

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
~~1. Shielding will be provided for the CP System.~~	~~1. Visual inspection of the as-built CP System will be performed.~~	~~1. Installed equipment is shielded in accordance with certified design.~~
1. A simplified configuration for the CP System is described in Section 2.10.4.	1. Construction records will be reviewed and visual inspections will be conducted for the configuration of the CP System.	1. The as-built configuration of the CP System is in accordance with the description in Section 2.10.4.
~~2. No safety-related equipment will be in the vicinity of the CP System.~~	~~2. Visual inspection of the as-built CP System will be performed.~~	~~2. Equipment is located as specified by certified design.~~
2. CP system wastes ~~will be~~ is collected in radiation controlled areas	2. Visual inspection of the ~~as-built~~ CP System will be performed.	2. Compliance with certified design commitment.
~~3. CP System wastes will be collected in controlled areas.~~	~~3. Visual inspection of the as-built CP System will be performed.~~	~~3. Compliance with certified design commitment.~~

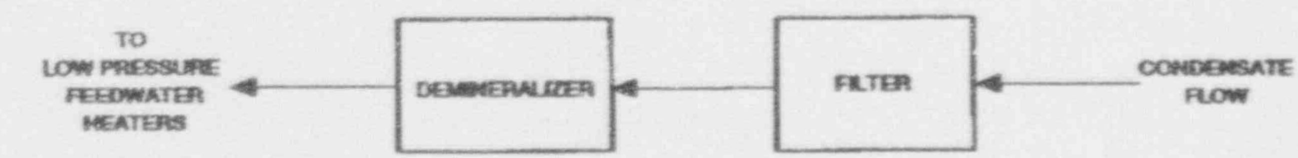


Figure 2.10.4 Condensate Purification System

2.10.7 Main Turbine

Design Description

The main Turbine Generator (TG) System converts the energy in steam from the nuclear steam supply system into electrical energy.

The TG System does not serve nor support any safety function and has no safety design basis. However, the TG System is a potential source of high energy missiles that could damage safety related equipment or structures.

The TG System is designed to prevent overspeed and thus ~~minimize~~ reducing the possibility of high energy missile generation from TG System moving parts.

The following ~~component~~ instrumentation, controls and valving redundancies are employed to guard against overspeed:

(1) Main stop valves (MSV)/Control valves (CV) [MSVs trip/CVs modulate].

(2) Intermediate stop valves/Intercept valves (CIVs) [CIVs trip].

(3) Primary speed control/Backup speed control.

(4) Fast acting solenoid valves/Emergency trip fluid system (ETS).

(5) Speed control/Overspeed trip/Backup overspeed trip.

Temperature, pressure and speed indications, as well as overspeed alarm are provided in the main control room.

The TG System is enclosed within the ~~t~~Turbine ~~b~~Building, which contains no safety-related equipment or structures. The turbine generator is orientated within the turbine building to be inline with the ~~r~~Reactor and ~~c~~Control ~~b~~Buildings to ~~minimise~~ reduce the potential for any high energy TG System generated missiles from damaging any safety-related equipment or structures.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.10.7 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria which will be undertaken for the TG System.

Table 2.10.7: Main Turbine Generator System

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The TG System ~~will be~~ is designed to prevent the turbine generator rotor from exceeding the design overspeed with redundant instrumentation, controls and valving, ~~such that a single failure of any component will not cause the rotor speed to exceed its design value.~~	1a. Conduct ~~V~~visual inspection and review construction records of the installed equipment, ~~together with simulated testing~~ 1b. Test the control logic of the as-built overspeed protection system with simulated overspeed signals.	1. a. Following ~~Design~~ provisions to prevent overspeed are in place~~.~~: (1) Main stop valves/control valves (2) Intermediate stop valves/intercept valves (CIVs) (3) Primary speed control/backup speed control (4) Fast acting solenoid/Emergency trip fluid system (ETS) (5) Speed control/Overspeed trip/Backup overspeed trip b. Valves that supply steam to turbine close upon receipt of overspeed signal.
2. ~~The turbine building will contain no safety-related equipment or structures.~~ The turbine generator ~~will be~~ is orientated to ~~minimize~~ reduce the potential for low trajectory high energy TG System missiles from damaging safety-related equipment or structures.	2. Conduct ~~V~~visual inspection of the as-built turbine building and plant arrangements.	2. Turbine generator ~~arrangements per approved plant design.~~ is in line with the reactor and control building.
3. Control room indicators ~~are~~ provided for TG System parameters defined in section 2.10.7.	3. Inspections will be performed to verify the presence of control room indicators for the TG System.	3. Instrumentation is present in the Control room as defined in Section 2.10.7.
4. Turbine stop valve will close in ≥ 0.10 sec	4. Perform test	4. Test results in closure time ≥ 0.10 sec
5. Turbine control valve fast close in ≥ 0.15 sec.	5. Perform test	5. Test results in closure time ≥ 0.15 sec

2.10.9 Turbine Gland Steam System

Design Description

The Turbine Gland Sealing (TGS) System (Figure 2.10.9) prevents the escape of radioactive steam from the turbine shaft/casing penetrations and valve stems and prevents air inleakage through subatmospheric turbine glands.

The TGS System consists of a sealing steam pressure regulator, sealing steam header, a gland steam condenser, with two full capacity exhaust blowers, and the associated piping, valves and instrumentation.

The TGS System does not serve or support any safety function and has no safety design basis.

The TGS System is designed to Quality Group D standards non-safety-related.

~~The outer portion of all glands of the turbine and main steam valves is connected to the gland steam condenser, which is maintained at a slight vacuum by the exhauster blower. During plant operation, the gland steam condenser and one of the two installed 100% capacity motor driven blowers are in operation. The exhauster blower to the turbine building compartment exhaust system effluent stream is continuously monitored prior to being discharged.~~

~~During normal operation, the steam seal header is supplied from the main steam path. The auxiliary steam system provides a 100% steam supply backup when high radiation levels are detected in the blower exhaust or the main steam path source(s) are unavailable.~~

~~A site specific radiological analysis will be required to determine what actions and at what levels.~~The TGSS steam supply ~~should~~ will be switched to the auxiliary source~~.~~ if the discharge steam radiation level exceeds setpoint.

Relief valves on the seal steam header prevent excessive seal steam pressure.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.10.9 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria which will be undertaken for the TGS System.

Table 2.10.9: Turbine Gland Steam System

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
~~1. Radiological releases will be maintained within established limits.~~	~~1. Visual inspection of the installed equipment coupled with a site specific radiological analysis and simulated signals to verify that the TGS System switches to auxiliary steam on high radiation levels.~~	~~1. System switches to auxiliary steam as required to limit radiological releases.~~
1. A simplified configuration for the TGS System is described in Section 2.10.9	1. Construction records will be reviewed and visual inspections will be conducted for the configuration of the TGS System.	1. The as-built configuration of the TGS System in accordance with the description in Section 2.10.9

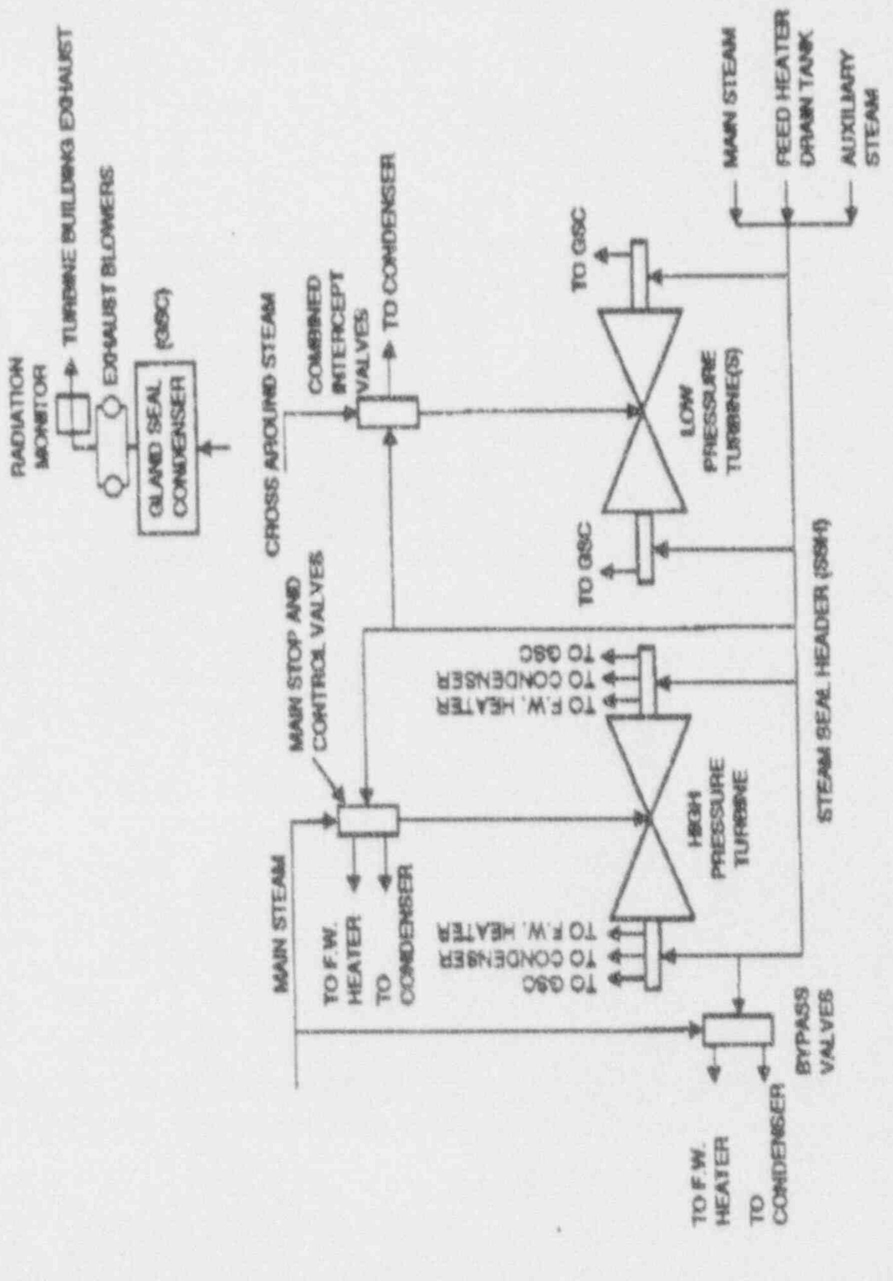


Figure 2.10.9 Turbine Gland Seal

2.10.13 Turbine Bypass System

Design Description

The Turbine Bypass (TB) System provides capability to discharge main steam from the reactor directly to the condenser to minimize step load reduction transients effects on the reactor coolant system. The system is also used to discharge main steam during reactor hot standby and cooldown operations.

The TB System does not serve or support any safety function and has no safety design basis. The TB System is designed to Quality Group D non-safety related.

~~There is no safety related equipment in the vicinity of the TB System. All high energy lines of t~~The TB System ~~are~~ is located in the turbine building ~~and no failure of high energy lines in the TB System will affect safety related equipment~~.

~~The TB System consists of (1) a three valve chest that is connected to the main steamlines upstream of the turbine stop valves, and (2) three dump lines that connect separately each regulating valve outlet to one condenser shell. The TB System is designed to bypass nominally 33% of the rated main steam flow directly to the condenser.~~

~~The TB System, in combination with the reactor systems, provides the capability to shed 40% of the turbine generator rated load without reactor trip.~~

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.10.13 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria which will be undertaken for the TB System.

Table 2.10.13: Turbine Bypsss System

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
~~1. Failure of high energy lines in the TB System will not affect safety related equipment.~~	~~1. Visual inspection of the installed TB System will be conducted.~~	~~1. Confirmation that high energy line breaks will not jeopardize any safety related equipment.~~
1. A simplified configuration for the TB System is described in Section 2.10.13.	1. Construction records will be reviewed and visual inspections will be conducted for the configuration of the TB System.	1. The as-built configuration of the TB System is in accordance with the description in Section 2.10.13.

2.10.21 Main Condenser

Design Description

The main condenser is designed to condense and deaerate the exhaust steam from the main turbine and provide a heat sink for the Turbine Bypass (TB) System.

The main condenser does not serve or support any safety function and has no safety design basis. ~~It is, however, designed with necessary shielding and controlled access to protect plant personnel from radiation.~~

The condenser is designed to Quality Group D non-safety related. The main condenser is designed to be supported under seismic conditions.

~~The main condenser is a multi shell type deaerating unit with a shell located directly beneath each of the low pressure turbines. Each shell has tube bundles through which circulating water flows. The condensing steam is collected in the condenser hotwells (the lower shell portion) which provide suction to the condensate pumps.~~

Since the main condenser operates at a vacuum, ~~any~~ leakage is into the shell side of the main condenser. Tubeside or circulating water inleakage is detected by measuring the conductivity of sample water extracted beneath the tube bundles. In addition, conductivity is ~~continuously~~ monitored at the discharge of the condensate pumps and alarms provided in the main control room.

A signal is provided to the reactor protection system on loss of vacuum.

~~In all operational modes, the condenser is at vacuum and consequently no radioactive releases can occur. Loss of vacuum sequentially leads to control room alarm, turbine trip and eventually bypass and main steam isolation valve closure to prevent condenser overpressurization. Additionally, to avoid a turbine trip on high condenser backpressure reactor recirculation runback is automatically initiated and, on a site specific basis setting, on a combination of high condenser backpressure and loss of a circulating water pump.~~

~~Ultimate overprotection is provided by rupture diaphragms on the turbine exhaust hoods.~~

~~The instrumentation and control features that monitor the performance to ensure that the condenser is in the correct operating mode include:~~

~~(1) Hotwell Water Level—Automatically controlled within preset limits. During normal full load operation with nominal hotwell levels, the main condenser provides a four minute active condensate storage volume and has a two minute surge capacity. At minimum normal~~

operating hotwell water level, and normal full load condensate flow rate, the condenser provides a two minute minimum holdup time for N-16 decay.

(2) Condenser Pressure—Key overall performance indicator that initiates alarms and trips at preset levels.

(3) Low Pressure Turbine Exhaust Hood Temperature—Automatically initiates turbine exhaust water sprays to protect the turbine.

(4) Inlet and Outlet Circulating Water Temperature—Monitors performance only

(5) Conductivity within the condenser and at the discharge of the condensate pumps—Initiates alarms at preset levels.

The main condenser potential for flooding is less than the Circulating Water (CW) System and, consequently flooding protection is the same as the CW System (2.10.23). Condenser pressure indicators are located above design basis any potential flood level.

Spray pipes and baffles are designed to protect the main condenser internals from high energy flow inputs.

Hydrogen buildup during operation is provided by continuous evacuation of the main condenser. Hydrogen sources are excluded during shutdown.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.10.21 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria which will be undertaken for the main condenser.

Table 2.10.21: Main Condenser

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. Overpressurization of the condenser will be prevented by condenser isolation from high energy sources.	1. Tests will be performed using simulated signals to verify that the system isolates.	1. System isolation occurs.
1. Condenser pressure sensors and transmitters are located above any potential flood levels.	1. Visual inspections of the as-built system will be conducted.	1. Condenser pressure indicators and transmitters are located above flood levels.
2. Condenser pressure indicators and transmitters will be located above any potential flood levels.	2. Visual inspections of the as-built system will be conducted.	2. Installed equipment is in compliance with the design commitment.
2. Control room features are provided for Main Condenser System parameters defined in Section 2.10.21	2. Inspections will be performed to verify the presence of control room indicators for the Main Condenser System	2. Instrumentation is present in the Control room as defined in Section 2.10.21
3. Shielding and controlled access shall be provided for the main condenser.	3. Visual inspections of the as-built system will be conducted.	3. Installed equipment meets the shielding and access control provisions of the certified design.
3. Main condenser supports are analyzed to demonstrate no gross failure under seismic conditions	3. Perform analysis.	3. Verify analysis performed.

2.10.23 Circulating Water System

Design Description

The Circulating Water (CW) System (Figure 2.10.23) provides a continuous supply of cooling water to the main condenser to remove the heat rejected by the turbine cycle and auxiliary systems.

The CW System does not serve or support any safety function and has no safety design basis.

To prevent flooding of the turbine building, the CW System is designed to automatically isolate in the event of gross system leakage. The circulating water pumps are tripped and the pump and condenser valves are closed in the event of a system isolation signal from the condenser area high-high level switches. A condenser area high level alarm is provided in the main control room.

A reliable logic scheme will be adopted to minimize potential for spurious isolation trips (e.g., 2-out of 3 logic).

The CW System is designed to and constructed in accordance with Quality Group D specifications non-safety related.

The CW System consists of the following components (Figure 2.10.23):

(1) Intake screens located in a screen house

(2) Pumps

(3) Condenser water boxes

(4) Piping and valves

(5) Tube side of the main condenser

(6) Water box fill and drain subsystem

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.10.23 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria which will be undertaken for the CW System.

Table 2.10.23: Circulating Water System

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. Flooding of the turbine building will be prevented by CW System isolation in the event of gross system leakage. Upon receipt of an isolation signal, the circulating water pumps will trip and the condenser valves close.	1. Testing of the Visual inspection of the installed equipment coupled with the analyses of the leakage/flooding characteristics of the as-built CW System will be performed using simulated signals to verify system isolates on high level.	1. CW System isolates upon receipt of an isolation signal. Pumps trip and condenser valves close.
2. A simplified configuration for the CW System is described in Section 2.10.23.	2. Construction records will be reviewed and visual inspections will be conducted for the configuration of the CW System.	2. The as-built configuration of the CW System is in accordance with the description in Section 2.10.23.
3. Control room sensors are provided for CW System parameters defined in Section 2.10.23.	3. Inspections will be performed to verify the presence of control room indicators for the 2.10.23 System.	3. Instrumentation is present in the Control room as defined in Section 2.10.23.

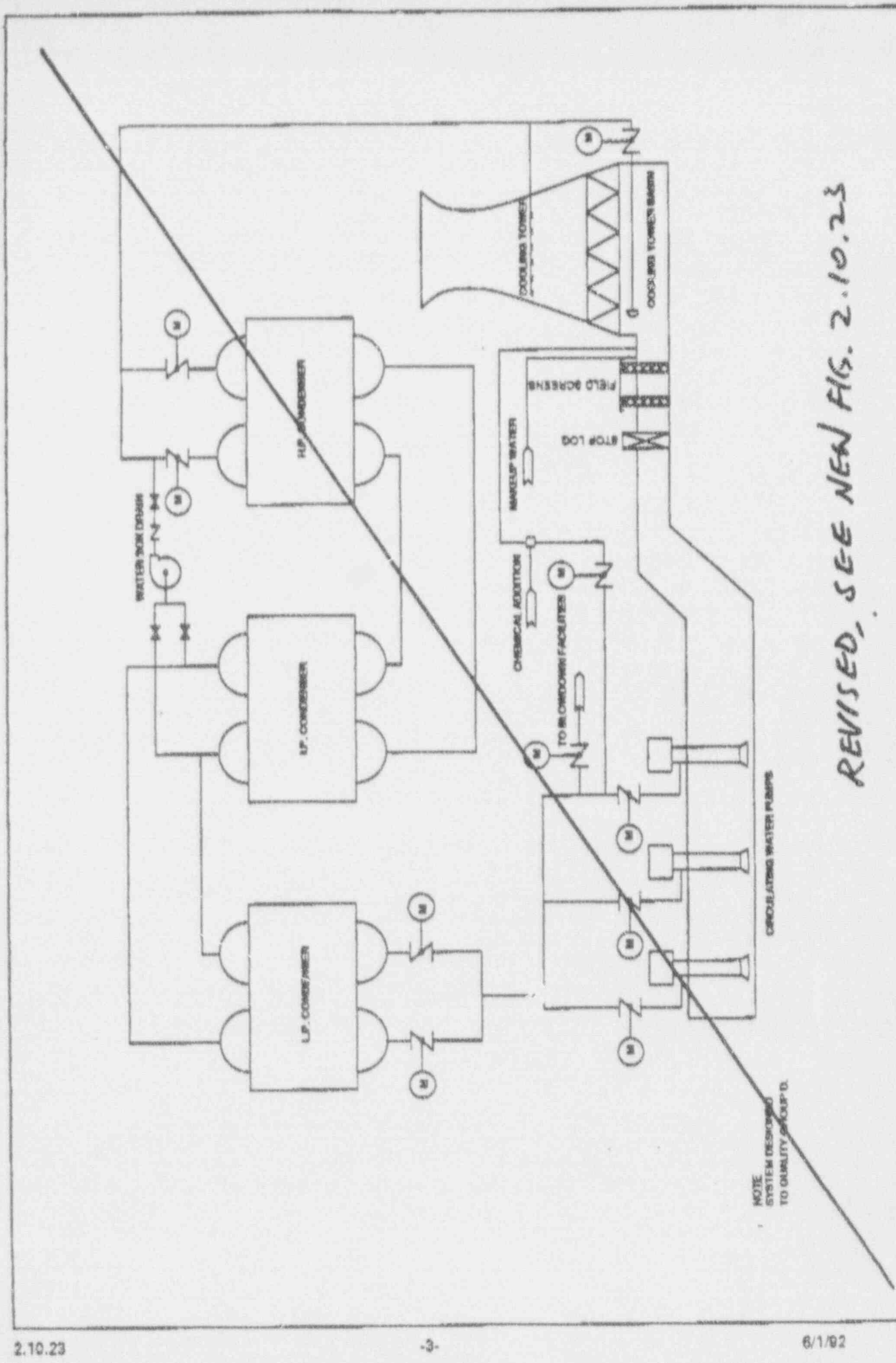


Figure 2.10.23 Circulating Water System

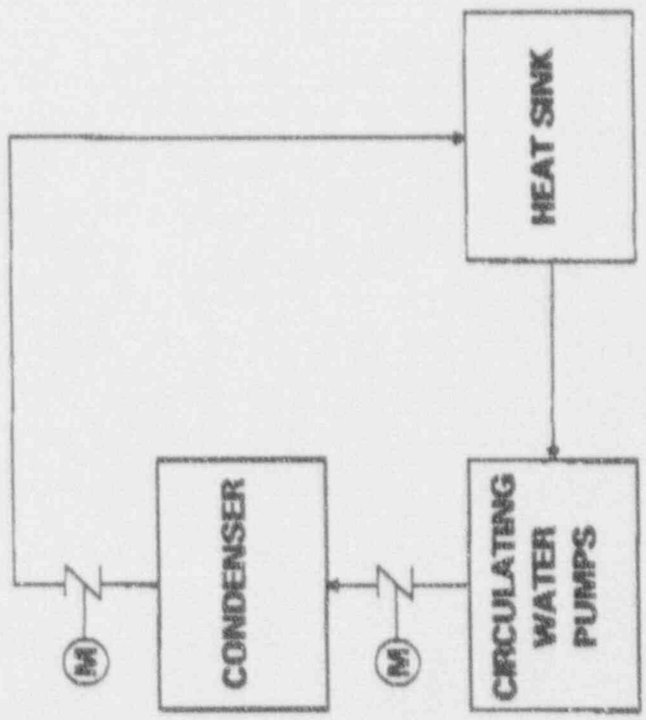


Figure 2.10.23 Circulating Water System