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Your ref: Project Number 740
Our ref: DCP/NRC1932

June 14, 2007

Subject: AP1000 COL Standard Technical Report Submittal of APP-GW-GLN-114, (TR 114), Revision 0

In support of Combined License application pre-application activities, Westinghouse is submitting AP1000 Standard Combined License Technical Report Number 114. This report identifies and justifies standard changes to the AP1000 Design Control Document (DCD). The changes to the DCD identified in Technical Report 114 are included in the proposed amendment to the AP1000 Design Certification Rule (DCD Revision 16). This report is submitted as part of the NuStart Bellefonte COL Project (NRC Project Number 740). The information included in this report is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification.

The purpose for submittal of this report was explained in a March 8, 2006 letter from NuStart to the NRC.

Pursuant to 10 CFR 50.30(b), APP-GW-GLN-114, Revision 0, "AP1000 Auxiliary Boiler Sizing and Design," (Technical Report Number 114), is submitted as Enclosure 1 under the attached Oath of Affirmation.

It is expected that when the NRC review of Technical Report Number 114 is complete, the changes to the DCD identified in Technical Report 114 will be considered approved generically for COL applicants referencing the AP1000 Design Certification.

Questions or requests for additional information related to content and preparation of this report should be directed to Westinghouse. Please send copies of such questions or requests for additional information to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Westinghouse requests the NRC to provide a schedule for review of the technical report within two weeks of its submittal.

D079



HRO

Very truly yours,

D. F. Hutchings for

A. Sterdis, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Attachment

1. "Oath of Affirmation," dated June 14, 2007

/Enclosure

1. APP-GW-GLN-114, Revision 0, "AP1000 Auxiliary Boiler Sizing and Design," Technical Report Number 114

| | | | | | |
|---|---|---|---|---|---|
| cc: | D. Jaffe | - | U.S. NRC | 1E | 1A |
| | E. McKenna | - | U.S. NRC | 1E | 1A |
| | G. Curtis | - | TVA | 1E | 1A |
| | P. Grendys | - | Westinghouse | 1E | 1A |
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| | D. Lindgren | - | Westinghouse | 1E | 1A |
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| | G. Zinke | - | NuStart/Entergy | 1E | 1A |
| | J. Vanderhoff | - | Westinghouse | 1E | 1A |

ATTACHMENT 1

"Oath of Affirmation"

ATTACHMENT 1

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

| | |
|---|---|
| In the Matter of: | ) |
| NuStart Bellefonte COL Project | ) |
| NRC Project Number 740 | ) |

APPLICATION FOR REVIEW OF
"AP1000 GENERAL COMBINED LICENSE INFORMATION"
FOR COL APPLICATION PRE-APPLICATION REVIEW

B. W. Bevilacqua, being duly sworn, states that he is Vice President, New Plants Engineering, for Westinghouse Electric Company; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission this document; that all statements made and matters set forth therein are true and correct to the best of his knowledge, information and belief.

Bruce H. Bevilacqua

B. W. Bevilacqua
Vice President
New Plants Engineering

Subscribed and sworn to
before me this 14th day
of June 2007.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Debra McCarthy, Notary Public
Monroeville Boro, Allegheny County
My Commission Expires Aug. 31, 2009
Member, Pennsylvania Association of Notaries

Debra McCarthy

Notary

ENCLOSURE 1

APP-GW-GLN-114, Revision 0

"AP1000 Auxiliary Boiler Sizing and Design"

Technical Report 114

**AP1000 DOCUMENT COVER SHEET**

TDC: Permanent File: APY

RFS#: RFS ITEM #:

| AP1000 DOCUMENT NO. | REVISION NO. | | ASSIGNED TO |
|---|---|---|---|
| APP-GW-GLN-114 | 0 | Page 1 of 44 | W-Sterdis |

ALTERNATE DOCUMENT NUMBER: TR 114 WORK BREAKDOWN #:

ORIGINATING ORGANIZATION: Westinghouse Electric Company

TITLE: **AP1000 Auxiliary Boiler Sizing and Design**

| ATTACHMENTS: | DCP #/REV. INCORPORATED IN THIS DOCUMENT REVISION: |
|---|---|
| N/A | |
| CALCULATION/ANALYSIS REFERENCE: N/A | |

| ELECTRONIC FILENAME | ELECTRONIC FILE FORMAT | ELECTRONIC FILE DESCRIPTION |
|---|---|---|
| APP-GW-GLN-114 R0 | MicrosoftWord | |



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Class 3 Documents being transmitted to the NRC require the following two review signatures in lieu of a Form 36.

| | | |
|---|---|---|
| LEGAL REVIEW J.C. VALENTINE | SIGNATURE/DATE J. C. Valentine | 5/30/2007 |
| PATENT REVIEW M. Corletti | SIGNATURE/DATE M. M. Corletti | 5/24/07 |

☐ WESTINGHOUSE PROPRIETARY CLASS 2



| | | | |
|---|---|---|---|
| ORIGINATOR J. F. Vanderhoff | SIGNATURE/DATE J. F. Vanderhoff | 05/24/07 | |
| REVIEWERS | SIGNATURE/DATE | | |
| | | | |
| | | | |
| VERIFIER M. E. Stella | SIGNATURE/DATE M. E. Stella | 5/24/07 | VERIFICATION METHOD Page by Page |
| AP1000 RESPONSIBLE MANAGER M. M. Corletti | SIGNATURE* M. M. Corletti | | APPROVAL DATE 5/24/07 |

* Approval of the responsible manager signifies that document is complete, all required reviews are complete, electronic file is attached and document is released for use.

APP-GW-GLN-114
Revision 0

June 2007

# AP1000 Standard Combined License Technical Report

## Title: AP1000 Aux. Boiler Sizing and Design

Westinghouse Electric Company LLC
P.O. Box 355
Pittsburgh, PA 15230-0355

**Document Number:** APP-GW-GLN-114 **Revision Number:** 0

**Title:** AP1000 Aux. Boiler Sizing and Design

## 1.0 INTRODUCTION

Chapter 10 of the Design Control Document (DCD) describes the AP1000 Auxiliary Steam System Design. Westinghouse has modified this design to alleviate issues in current plants related to operational problems due to fuel fouling in diesel-fired boilers in stand-by service. This report summarizes changes to the design, and includes the DCD (reference 1) mark up.

The portions of the AP1000 DCD affected include:

Tier 1: TOC, Sections 1.4 & 2.3.3, Figure 2.6.1-1, Tables 2.3.3-2 & 2.6.1-5

Tier 2: TOC, Sections 8.1.4.2, 8.3, 9.5.4, 9A.3.2.6, 10.4.10, Figures 1.2-2, 8.3.1-1, 9.5.4-1 & 12.3-1, Tables 1.7-2, 3.2-4, 8.3.1-3, 9.5.4-1 & 9.5.4-2, 9A-3

## 2.0 APPLICABILITY DETERMINATION

This evaluation is prepared to document that the change described above is a departure from Tier 2 information of the AP1000 Design Control Document (DCD) that may be included in plant specific FSARs without prior NRC approval.

| | | | |
|---|---|---|---|
| A. | Does the proposed change include a change to: | | |
| | 1. Tier 1 of the AP1000 Design Control Document APP-GW-GL-700 | ☐ NO ☒ YES | (If YES prepare a report for NRC review of the changes) |
| | 2. Tier 2* of the AP1000 Design Control Document, APP-GW-GL-700 | ☐ NO ☒ YES | (If YES prepare a report for NRC review of the changes) |
| | 3. Technical Specification in Chapter 16 of the AP1000 Design Control Document, APP-GW-GL-700 | ☒ NO ☐ YES | (If YES prepare a report for NRC review of the changes) |
| B. | Does the proposed change involve: | | |
| | 1. Closure of a Combined License Information Item identified in the AP1000 Design Control Document, APP-GW-GL-700 | ☒ NO ☐ YES | (If YES prepare a COL item closure report for NRC review.) |
| | 2. Completion of an ITAAC item identified in Tier 1 of the AP1000 Design Control Document, APP-GW-GL-700 | ☒ NO ☐ YES | (If YES prepare an ITAAC completion report for NRC review.) |

☐ The questions above are answered no, therefore the departure from the DCD in a COL application does not require prior NRC review unless review is required by the criteria of 10 CFR Part 52 Appendix D Section VIII B.5.b. or B.5c

## 3.0 TECHNICAL BACKGROUND

Utilities have reported operational problems due to fouling of the fuel in diesel boilers that sit idle for extended periods of time. Some have changed their aux. steam boilers to electric boilers and others have eliminated their aux. steam boilers entirely and rely on rental units for aux. steam.

For AP1000, Westinghouse has proposed a design change from a diesel fired aux. steam boiler to an electric aux. steam boiler.

While making the change to an electric boiler, the arrangement of the aux. steam system was also evaluated and some changes made to minimize the size of the electric boiler.

The changes to the arrangement are summarized below.

1. Currently, aux. boiler steam is used for start up from 0 to 25-30% power operation. In the proposed arrangement, aux. boiler steam will be supplemented by main steam from the main steam header and then from the extraction steam during start-up. There is already a crosstie from the main steam header to the aux. steam system that allows steam from the main steam header to be used for deaerator pegging steam upon a sudden loss of the turbine load. This same line can be used to provide main steam to the aux. steam system during start-up from 0% load until there is sufficient flow and pressure available at the extraction steam line used during normal operation. This change reduces the size requirement on the aux. boiler by over 50%. (From approximately 70 MW to 25 MW).

2. The fuel oil pumps, ducting and fans associated with the diesel fired boiler will be removed from the turbine building.

3. A 25 MW electric boiler will be installed in the boiler room of the turbine building along with its associated electrical equipment including:
   a. Load center
   b. Switchgear
   c. MCC

   Note: A third UAT (Sized to supply the 25 MVA boiler + up to 8 MVA additional for other site specific loads) will be located outside the turbine building in the transformer area.

Aside from the changes mentioned above, the aux. boiler will continue to supply steam in the same manner as the current design.

- The aux. boiler will still provide the VYS and blanketing steam during extended periods of shutdown.

- In preparation for start up, the aux. boiler will provide steam for the turbine gland seals and for pegging the deaerator.

- Once the primary side is up to full temperature, steam from the main steam header will be used to supplement the aux. boiler steam to support start-up
- When there is sufficient pressure at the turbine extraction, the aux. boiler will also be supplemented with extraction steam.
- When there is sufficient main and/or extraction steam available, the aux. boiler may be shut down.
- Upon a sudden loss of the turbine (loss of extraction steam), the aux. steam system will be supplied by the crosstie to the main steam header, just the same as in the current design.
- Warming steam will continue to be provided from the steam generators, and is not a load to be considered for aux. boiler sizing.

There is no affect on nuclear safety due to the new aux. steam system design. The new design conforms to the present reactor interface requirements and does not require a change to be made to the Nuclear Island.

## 4.0 DCD MARK-UP

Need to change the title of the DOS system from "Standby Diesel and Auxiliary Boiler Fuel Oil System" to "Standby Diesel Fuel Oil System" everywhere that it appears in Tier 1 and Tier 2 of the DCD.

This includes the following locations:

Tier 1:

Master Table of Contents, page i

List of Figures, page iv

Sections 1.4 & 2.3.3

Tier 2:

Master Table of Contents, page xvi

Page 3.2-15

Tables 1.7-2 & 3.2-4

Chapter 9 Table of Contents, pages vi and x

Chapter 9 List of Figures, page xi

Section 9.5 (in several places as shown in mark ups below)

Title of Figure 9.5.4-1 sheets 1, 2 and 3

**Tier 1 Mark-ups**

**2.3.3 Standby Diesel ~~and Auxiliary Boiler~~ Fuel Oil System**

**Design Description**

The standby diesel ~~and auxiliary boiler~~ fuel oil system (DOS) supplies diesel fuel oil for the onsite standby power system. The diesel fuel oil is supplied by two above-ground fuel oil storage tanks. The DOS also provides fuel oil for the ancillary diesel generators. A single fuel oil storage tank services both ancillary diesel generators.

The DOS is as shown in Figure 2.3.3-1 and the component locations of the DOS are as shown in Table 2.3.3-3.

1. The functional arrangement of the DOS is as described in the Design Description of this Section 2.3.3.

2. The ancillary diesel generator fuel tank can withstand a seismic event.

3. The DOS provides the following nonsafety-related functions:

   a) Each fuel oil storage tank provides for at least 7 days of continuous operation of the associated standby diesel generator.

   b) Each fuel oil day tank provides for at least four hours of continuous operation of the associated standby diesel engine generator.

   c) The fuel oil flow rate to the day tank of each standby diesel generator provides for continuous operation of the associated diesel generator.

   d) The ancillary diesel generator fuel tank is sized to supply power to long-term safety-related post-accident monitoring loads and control room lighting through a regulating transformer and one PCS recirculation pump for a period of 4 days.

4. Controls exist in the main control room (MCR) to cause the components identified in Table 2.3.3-1 to perform the listed function.

5. Displays of the parameters identified in Table 2.3.3-1 can be retrieved in the MCR.

**Inspections, Tests, Analyses, and Acceptance Criteria**

Table 2.3.3-2 specifies the inspections, tests, analyses, and associated acceptance criteria for the DOS.

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| 1. The functional arrangement of the DOS is as described in the Design Description of this Section 2.3.3. | Inspection of the as-built system will be performed. | The as-built DOS conforms with the functional arrangement described in the Design Description of this Section 2.3.3. |
| 2. The ancillary diesel generator fuel tank can withstand a seismic event. | Inspection will be performed for the existence of a report verifying that the as-installed ancillary diesel generator fuel tank and its anchorage are designed using seismic Category II methods and criteria. | A report exists and concludes that the as-installed ancillary diesel generator fuel tank and its anchorage are designed using seismic Category II methods and criteria. |
| 3.a) Each fuel oil storage tank provides for at least 7 days of continuous operation of the associated standby diesel generator. | Inspection of each fuel oil storage tank will be performed. | The volume of each fuel oil storage tank between the diesel generator fuel oil day tank supply connection and the **minimum level setpoint** ~~auxiliary boiler supply connection~~ is greater than or equal to 55,000 gallons. |
| 3.b) Each fuel oil storage day tank provides for at least 4 hours of operation of the associated standby diesel generator. | Inspection of the fuel oil day tank will be performed. | The volume of each fuel oil day tank is greater than or equal to 1300 gallons. |
| 3.c) The fuel oil flow rate to the day tank of each standby diesel generator provides for continuous operation of the associated diesel generator. | Testing will be performed to determine the flow rate. | The flow rate delivered to each day tank is 8 gpm or greater. |
| 3.d) The ancillary diesel generator fuel tank is sized to supply power to long-term safety-related post accident monitoring loads and control room lighting through a regulating transformer and one PCS recirculation pump for four days. | Inspection of the ancillary diesel generator fuel tank will be performed. | The volume of the ancillary diesel generator fuel tank is greater than or equal to 650 gallons. |
| 4. Controls exist in the MCR to cause the components identified in Table 2.3.3-1 to perform the listed function. | Testing will be performed on the components in Table 2.3.3-1 using controls in the MCR. | Controls in the MCR operate to cause the components listed in Table 2.3.3-1 to perform the listed functions. |
| 5. Displays of the parameters identified in Table 2.3.3-1 can be retrieved in the MCR. | Inspection will be performed for retrievability of parameters in the MCR. | The displays identified in Table 2.3.3-1 can be retrieved in the MCR. |

| TABLE 2.6.1-5 | | |
|---|---|---|
| **Component Name** | **Tag No.** | **Component Location** |
| RCP Circuit Breaker | ECS-ES-31 | Auxiliary Building |
| RCP Circuit Breaker | ECS-ES-32 | Auxiliary Building |
| RCP Circuit Breaker | ECS-ES-41 | Auxiliary Building |
| RCP Circuit Breaker | ECS-ES-42 | Auxiliary Building |
| RCP Circuit Breaker | ECS-ES-51 | Auxiliary Building |
| RCP Circuit Breaker | ECS-ES-52 | Auxiliary Building |
| RCP Circuit Breaker | ECS-ES-61 | Auxiliary Building |
| RCP Circuit Breaker | ECS-ES-62 | Auxiliary Building |
| 6900 V Switchgear Bus 1 | ECS-ES-1 | Annex Building |
| 6900 V Switchgear Bus 2 | ECS-ES-2 | Annex Building |
| 6900 V Switchgear Bus 3 | ECS-ES-3 | Turbine Building |
| 6900 V Switchgear Bus 4 | ECS-ES-4 | Turbine Building |
| 6900 V Switchgear Bus 5 | ECS-ES-5 | Turbine Building |
| 6900 V Switchgear Bus 6 | ECS-ES-6 | Turbine Building |
| **6900 V Switchgear Bus 7** | **ECS-ES-7** | **Turbine Building** |
| Main Generator | ZAS-MG-01 | Turbine Building |
| Generator Circuit Breaker | ZAS-ES-01 | Turbine Building |
| Main Step-up Transformer | ZAS-ET-1A | Yard |
| Main Step-up Transformer | ZAS-ET-1B | Yard |
| Main Step-up Transformer | ZAS-ET-1C | Yard |
| Unit Auxiliary Transformer A | ZAS-ET-2A | Yard |
| Unit Auxiliary Transformer B | ZAS-ET-2B | Yard |
| **Unit Auxiliary Transformer C** | **ZAS-ET-2C** | **Yard** |
| Reserve Auxiliary Transformer | ZAS-ET-4 | Yard |
| Ancillary Diesel Generator #1 | ECS-MG-01 | Annex Building |
| Ancillary Diesel Generator #2 | ECS-MG-02 | Annex Building |
| Ancillary Diesel Generator Distribution Panel 1 | ECS-ED-01 | Annex Building |
| Ancillary Diesel Generator Distribution Panel 1 | ECS-ED-02 | Annex Building |

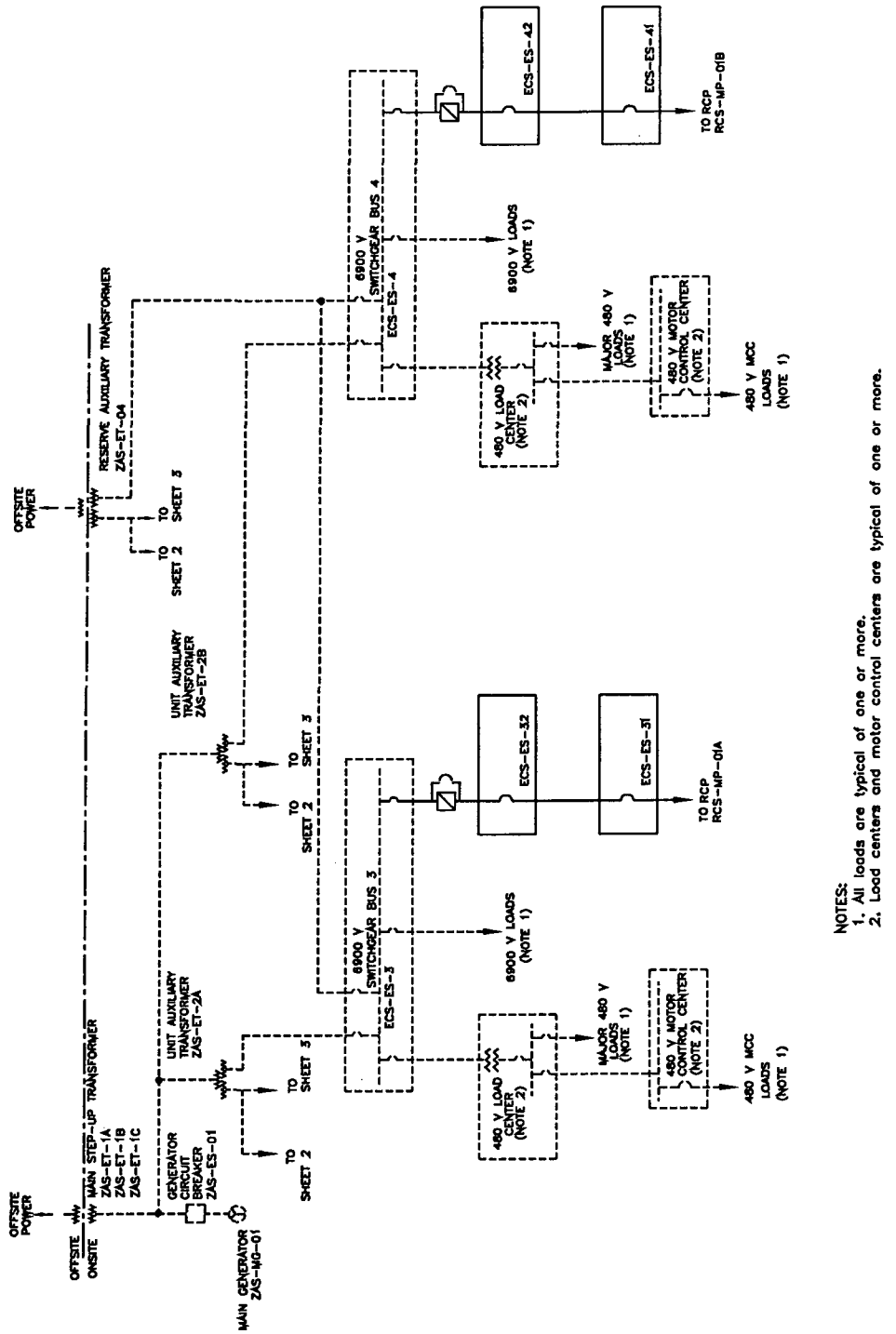
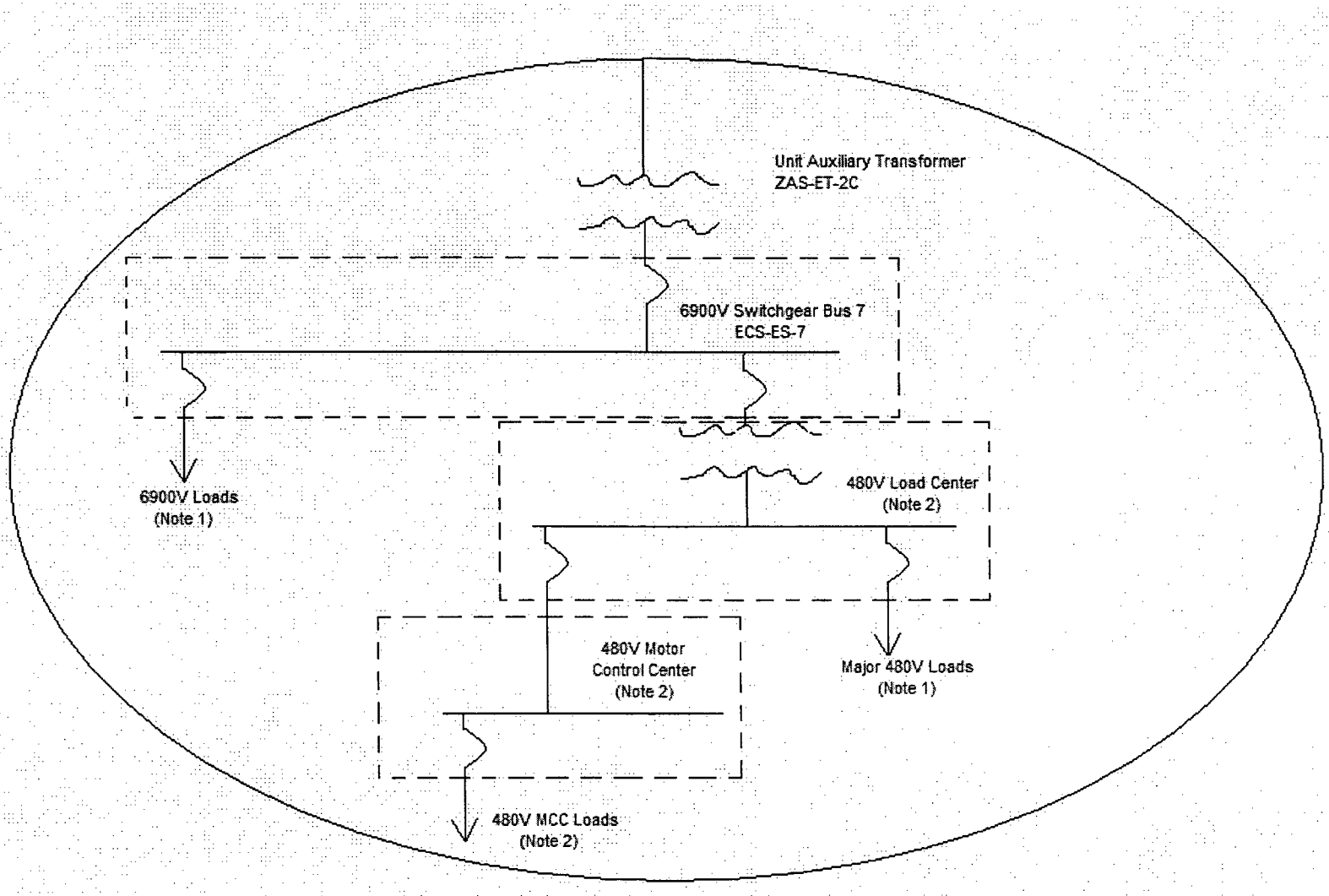

OFFSITE POWER
OFFSITE
ONSITE
MAIN STEP-UP TRANSFORMER ZAS-ET-1A ZAS-ET-1B ZAS-ET-1C
GENERATOR CIRCUIT BREAKER ZAS-ES-01
MAIN GENERATOR ZAS-MG-01
UNIT AUXILIARY TRANSFORMER ZAS-ET-2A
UNIT AUXILIARY TRANSFORMER ZAS-ET-2B
RESERVE AUXILIARY TRANSFORMER ZAS-ET-04
TO SHEET 2
TO SHEET 3
TO SHEET 5
6900 V SWITCHGEAR BUS 3
6900 V SWITCHGEAR BUS 4
ECS-ES-3
ECS-ES-4
6900 V LOADS (NOTE 1)
480 V LOAD CENTER (NOTE 2)
MAJOR 480 V LOADS (NOTE 1)
480 V MOTOR CONTROL CENTER (NOTE 2)
480 V MCC LOADS (NOTE 1)
ECS-ES-31
ECS-ES-32
ECS-ES-41
ECS-ES-42
TO RCP RCS-MP-01A
TO RCP RCS-MP-01B
NOTES:
1. All loads are typical of one or more.
2. Load centers and motor control centers are typical of one or more.

Figure 2.6.1-1

**Document Number:** APP-GW-GLN-114 **Revision Number:** 0

**Title:** AP1000 Aux. Boiler Sizing and Design



Tier 2 Mark-ups

**8.1.4.2 Onsite Power System**

**8.1.4.2.1 Safety Design Basis**

- The Class 1E dc and UPS power system meets the single failure criterion (GDC 17).
- The Class 1E dc and UPS system has sufficient capacity to achieve and maintain safe shutdown of the plant for 72 hours following a complete loss of all ac power sources without requiring load shedding for the first 24 hours.
- The Class 1E dc and UPS system is divided into four independent divisions. Any three-out-of-four divisions can shut down the plant safely and maintain it in a safe shutdown condition.
- Separation criteria preserve the independence of redundant Class 1E circuits as described in subsection 8.3.2.4 and no single credible event is capable of disabling redundant safety-related systems.
- Special identification criteria are applied for Class 1E equipment, cabling, and raceways as described in subsection 8.3.2.3.
- The Class 1E systems and equipment are designed to permit periodic inspection and testing (GDC-18).
- The Class 1E dc and UPS power system permits connection of any one 125 Vdc switchboard at a time to the spare battery and the spare battery charger. The spare battery and charger have sufficient capacity to permit continuous plant operation at 100-percent power in case of a failure or unavailability of one Class 1E battery bank and the associated battery charger.
- Two ancillary diesel generators provide ac power for Class 1E post-accident monitoring, MCR lighting, MCR and I&C room ventilation, and power to refill the PCS water storage tank and spent fuel pool if no other sources of power are available. The equipment used to perform this function is not safety-related because it is not needed for a prolonged period following a loss of ac and it is easily replaced with transportable generators.

**8.1.4.2.2 Power Generation Design Basis**

- The main ac power system is a non-Class 1E system and nonsafety-related. The normal power supply to the main ac power system comes from the station main generator through two identically rated unit auxiliary transformers **and an additional unit aux. transformer for the electric auxiliary boiler and site specific loads.**
- The onsite standby power system supplies ac power to the selected permanent nonsafety loads in the event of a main generator trip concurrent with the loss of preferred power

source. The onsite standby diesel generators are automatically connected to the associated 6.9 kV buses upon loss of bus voltage only after the generator rated voltage and frequency is established. Loads that are important for orderly plant shutdown are sequentially connected as shown in subsection 8.3.1 during this event.

## 8.3 Onsite Power Systems

### 8.3.1 AC Power Systems

#### 8.3.1.1 Description

The onsite ac power system is a non-Class 1E system comprised of a normal, preferred, maintenance and standby power supplies. The normal, preferred, and maintenance power supplies are included in the main ac power system. The standby power is included in the onsite standby power system. The Class 1E and non-Class 1E 208/120 Vac instrumentation power supplies are described in subsection 8.3.2 as a part of uninterruptible power supply in the dc power systems.

##### 8.3.1.1.1 Onsite AC Power System

The main ac power system is a non-Class 1E system and does not perform any safety-related functions. It has nominal bus voltage ratings of 6.9 kV, 480 V, 277 V, 208 V, and 120 V.

Figure 8.3.1-1 shows the main generator, transformers, feeders, buses, and their connections. The ratings of major ac equipment are listed in Table 8.3.1-3.

During power generation mode, the turbine generator normally supplies electric power to the plant auxiliary loads through the unit auxiliary transformers. The plant is designed to sustain a load rejection from 100 percent power with the turbine generator continuing stable operation while supplying the plant house loads. The load rejection feature does not perform any safety function.

During plant startup, shutdown, and maintenance the generator breaker remains open. The main ac power is provided by the preferred power supply from the high-voltage switchyard (switchyard voltage is site-specific) through the plant main stepup transformers and two unit auxiliary transformers. Each unit auxiliary transformer supplies power to about 50 percent of the plant loads.

A maintenance source is provided to supply power through a reserve auxiliary transformer. The maintenance source and the associated reserve auxiliary transformer primary voltage are site specific. The reserve auxiliary transformer is sized so that it can be used in place of either of the unit auxiliary transformers, if needed.

The **two** unit auxiliary transformers have two identically rated 6.9 kV secondary windings. ***The third UAT is a two winding transformer sized to accommodate the electric boiler and site specific loads.*** Secondaries of the auxiliary transformers are connected to the 6.9 kV switchgear buses by nonsegregated phase buses. The primary of the unit auxiliary transformer is connected to the main generator isolated phase bus duct tap. The 6.9 kV switchgear designation, location, connection, and connected loads are shown in Figure 8.3.1-1. The buses tagged with odd numbers (ES1, ES3, etc.) are connected to one unit auxiliary transformer and the buses tagged with even numbers (ES2, ES4, etc.) are connected to the other unit auxiliary transformer. **ES7 is connected to the third UAT.** ~~These~~ 6.9 kV buses **ES1-ES6** are provided with an access to the maintenance source through normally open

circuit breakers connecting the bus to the reserve auxiliary transformer. **ES7 is not connected to the maintenance source.** Bus transfer to the maintenance source is manual.

The arrangement of the 6.9 kV buses permits feeding functionally redundant pumps or groups of loads from separate buses and enhances the plant operational flexibility. The 6.9 kV switchgear powers large motors, and the load center transformers. There are two switchgear (ES1 and ES2) located in the annex building, and ~~four~~ **five** (ES3, ES4, ES5, ES6 and ES7) in the turbine building.

The main stepup transformers have protective devices for sudden pressure, neutral overcurrent, and differential current. The unit auxiliary transformers have protective devices for sudden pressure, overcurrent, differential current, and neutral overcurrent. If these devices sense a fault condition the following actions will be automatically taken:

- Trip high-side (grid) breaker
- Trip generator breaker
- Trip exciter field breaker
- Trip the 6.9 kV buses connected to the faulted transformer

The reserve auxiliary transformer has protective devices for sudden pressure, overcurrent, and differential current. The reserve auxiliary transformer protective devices trip the reserve supply breaker and any 6.9 kV buses connected to the reserve auxiliary transformer.

The onsite standby power system powered by the two onsite standby diesel generators supplies power to selected loads in the event of loss of normal, and preferred ac power supplies. Those loads that are priority loads for defense-in-depth functions based on their specific functions (permanent nonsafety loads) are assigned to buses ES1 and ES2. These plant permanent nonsafety loads are divided in two functionally redundant load groups (degree of redundancy for each load is described in the sections for the respective systems). Each load group is connected to either bus ES1 or ES2. Each bus is backed by a non-Class 1E onsite standby diesel generator. In the event of a loss of voltage on these buses, the diesel generators are automatically started and connected to the respective buses. The source incoming breakers on switchgear ES1 and ES2 are interlocked to prevent inadvertent connection of the onsite standby diesel generator and preferred/maintenance ac power sources to the 6.9 kV buses at the same time. The diesel generator however, is capable of being manually paralleled with the preferred power supply for periodic testing. Design provisions protect the diesel generators from excessive loading beyond the design maximum rating, should the preferred power be lost during periodic testing. The control scheme, while protecting the diesel generators from excessive loading, does not compromise the onsite power supply capabilities to support the defense-in-depth loads. See subsection 8.3.1.1.2 for starting and load sequencing of standby diesel generators.

The reactor coolant pumps (RCPs) are powered from the four switchgear buses located in the turbine building, one RCP per bus. Variable-speed drives are provided for RCP startup and for RCP operation when the reactor trip breakers are open. During normal power operation

(reactor trip breakers are closed), 60 Hz power is provided directly to the RCPs and the variable-speed drives are not connected.

Each RCP is powered through two Class 1E circuit breakers connected in series. These are the only Class 1E circuit breakers used in the main ac power system for the specific purpose of satisfying the safety-related tripping requirement of these pumps. The reactor coolant pumps connected to a common steam generator are powered from two different auxiliary transformers. The bus assignments for the reactor coolant pumps are shown in Figure 8.3.1-1.

The 480 V load centers supply power to selected 460 V motor loads and to motor control centers. Bus tie breakers are provided between two 480 V load centers each serving predominantly redundant loads. **Load Center 71 associated with UAT3 and ES-7 does not have an equivalent match.** This intertie allows restoration of power to selected loads in the event of a failure or maintenance of a single load center transformer. The bus tie breakers are interlocked with the corresponding bus source incoming breakers so that one of the two bus source incoming breakers must be opened before the associated tie breaker is closed.

The 480 V motor control centers supply power to 460 V motors not powered directly from load centers, while the 480/277 V, and 208/120 V distribution panels provide power for miscellaneous loads such as unit heaters, space heaters, and lighting system. The motor control centers also provide ac power to the Class 1E battery chargers for the Class 1E dc power system as described in subsection 8.3.2.

Two ancillary ac diesel generators, located in the annex building, provide ac power for Class 1E post-accident monitoring, MCR lighting, MCR and I&C room ventilation, and pump power to refill the PCS water storage tank and the spent fuel pool, when all other sources of power are not available.

Each ancillary ac generator output is connected to a distribution panel. The distribution panel is located in the room housing the diesel generators. The distribution panel has incoming and outgoing feeder circuit breakers as shown on Figure 8.3.1-3. The outgoing feeder circuit breakers are connected to cables which are routed to the divisions B and C voltage regulating transformers and to the PCS pumps. Each distribution panel has the following outgoing connections:

- Connection for Class 1E voltage regulating transformer to power the post-accident monitoring loads, the lighting in the main control room, and ventilation in the main control room and divisions B and C I&C rooms.
- Connection for PCS recirculation pump to refill the PCS water storage tank and the spent fuel pool.
- Connection for local loads to support operation of the ancillary generator (lighting and fuel tank heating).
- Temporary connection for a test load device (e.g., load resistor).
- See Figure 8.3.1-3 for connections to post-72-hour loads.

#### 8.3.1.1.1.1 Electric Circuit Protection

Protective relay schemes and direct acting trip devices on circuit breakers:

- Provide safety of personnel
- Minimize damage to equipment

#### 8.3.1.1.3 *Ancillary ac Diesel Generators*

Power for Class 1E post-accident monitoring, MCR lighting, MCR and divisions B and C I&C room ventilation and for refilling the PCS water storage tank and the spent fuel pool when no other sources of power are available is provided by two ancillary ac diesel generators located in the annex building. The ancillary generators are not needed for refilling the PCS water storage tank, spent fuel pool makeup, post-accident monitoring or lighting for the first 72 hours following a loss of all other ac sources.

The generators are classified as AP1000 Class D. The generators are commercial, skid-mounted, packaged units and can be easily replaced in the event of a failure. Generator control is manual from a control integral with the diesel skid package. These generators are located in the portion of the Annex Building that is a Seismic Category II structure. Features of this structure which protect the function of the ancillary generators are analyzed and designed for Category 5 hurricanes, including the effects of sustained winds, maximum gusts, and associated wind-borne missiles.

The fuel for the ancillary generators is stored in a tank located in the same room as the generators. The tank is Seismic Category II and holds sufficient fuel for 4 days of operation.

#### 8.3.1.1.4 Electrical Equipment Layout

The main ac power system distributes ac power to the reactor, turbine, and balance of plant (BOP) auxiliary electrical loads for startup, normal operation, and normal/emergency shutdown.

The medium voltage switchgear ES1 and ES2 are located in the electrical switchgear rooms 1 and 2 of the annex building. The incoming power is supplied from the unit auxiliary transformers ET2A and ET2B (X windings) via nonsegregated buses. The nonsegregated buses are routed from the transformer yard to the annex building in the most direct path practical.

The switchgear ES3, ES4, ES5, and ES6 are located in the turbine building electrical switchgear rooms. The incoming power is supplied from the unit auxiliary transformers ET2A and ET2B (Y windings) via nonsegregated buses to ES3 and ES4 and from ET2A and ET2B (X windings) to ES5 and ES6. **Switchgear ES7 is located in the aux. boiler room in the turbine building.**

The Class 1E medium voltage circuit breakers, ES31, ES32, ES41, ES42, ES51, ES52, ES61, and ES62, for four reactor coolant pumps are located in the auxiliary building.

The 480 V load centers are located in the turbine building electrical switchgear rooms 1 and 2 and in the annex building electrical switchgear rooms 1 and 2 based on the proximity of loads and the associated 6.9 kV switchgear. **Load Center 71 is located in the aux. boiler room in the turbine building.**

| TABLE 8.3.1-3COMPONENT DATA - MAIN AC POWER SYSTEM (NOMINAL VALUES) | | |
|---|---|---|
| **1.** | **Main Stepup Transformer** | |
| | | 3 single phase, FOA, 65°C rise, liquid filled |
| **2.** | **Unit Auxiliary Transformers (UATs 1&2)** | |
| | | 3 phase, 3 winding<br>H = 70 MVA, OA, 65°C<br>X = 35 MVA, OA, 65°C<br>Y = 35 MVA, OA, 65°C |
| | **Unit Auxiliary Transformer 3 (UAT3)** | |
| | | **3 phase, 2 winding**<br>**33 MVA, OA, 65°C** |
| | **Reserve Auxiliary Transformer (RAT)** | |
| | | 3 phase, 3 winding<br>H = 70 MVA, OA, 65°C<br>X = 35 MVA, OA, 65°C<br>Y = 35 MVA, OA, 65°C |
| **3.** | **6.9 kV Switchgear** | |
| | | medium voltage metal-clad switchgear<br>MVA Class - 500 MVA<br>vacuum-type circuit breaker |
| **4.** | **480 V Load Centers** | |
| | Transformers - Indoor, Air-Cooled Ventilated Dry-Type, Fire Retardant: | 2500 kVA, AA,<br>3 phase, 60 Hz<br>6900 - 480 V |
| | Main Bus Ampacity | 4000 amperes continuous |
| | 480V Breakers | metal enclosed draw-out circuit breaker or motor-starter (contactor)<br>65,000 A RMS symmetrical interrupting rating |
| **5.** | **480 V Motor Control Centers** | |
| | Horizontal Bus | 800 A continuous rating<br>65,000 A RMS symmetrical bracing |
| | Vertical Bus | 300 A continuous rating<br>65,000 A RMS symmetrical bracing |
| | Breakers (molded case) | 65,000 A RMS symmetrical interrupting rating |

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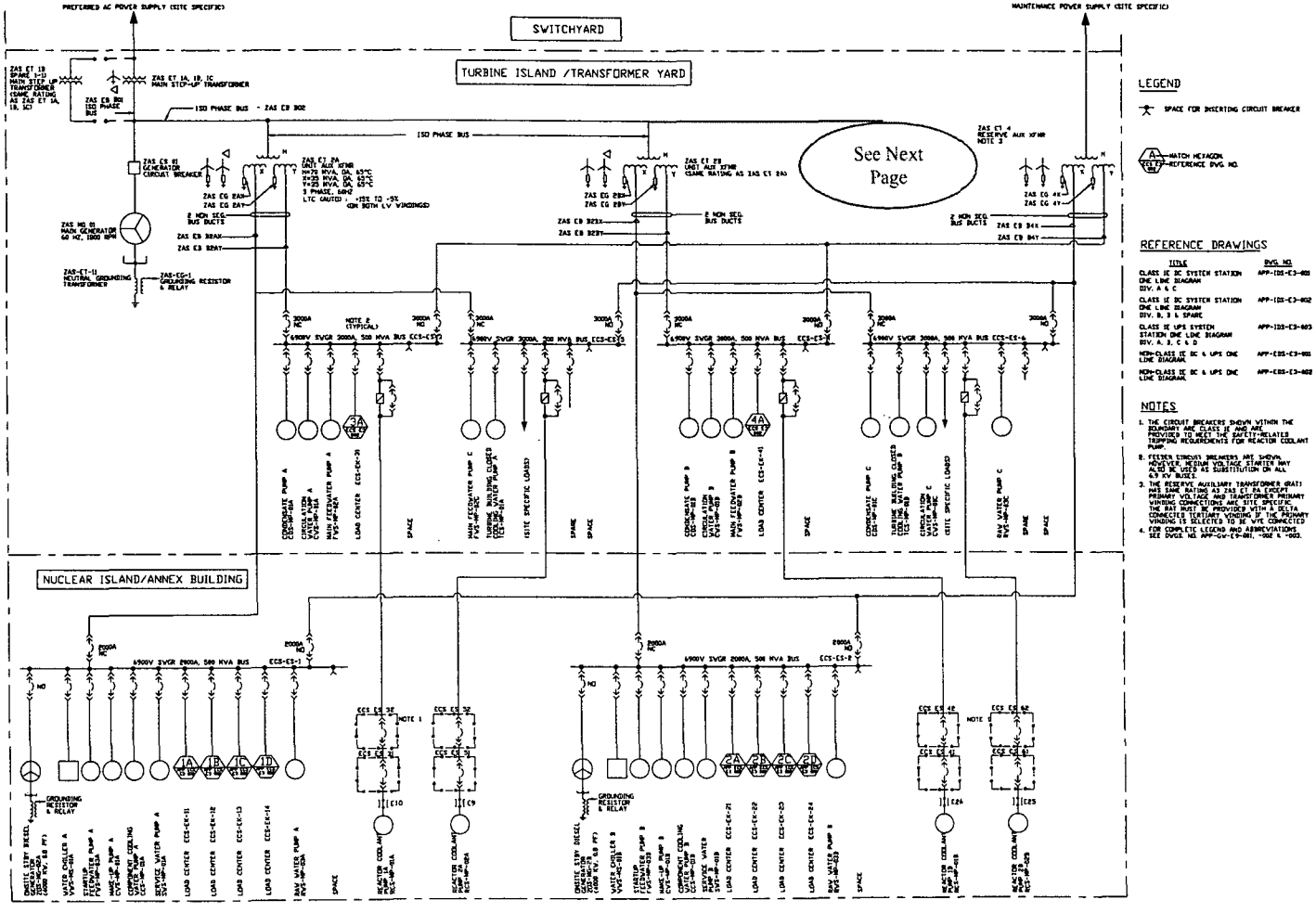


Figure 8.3.1-1

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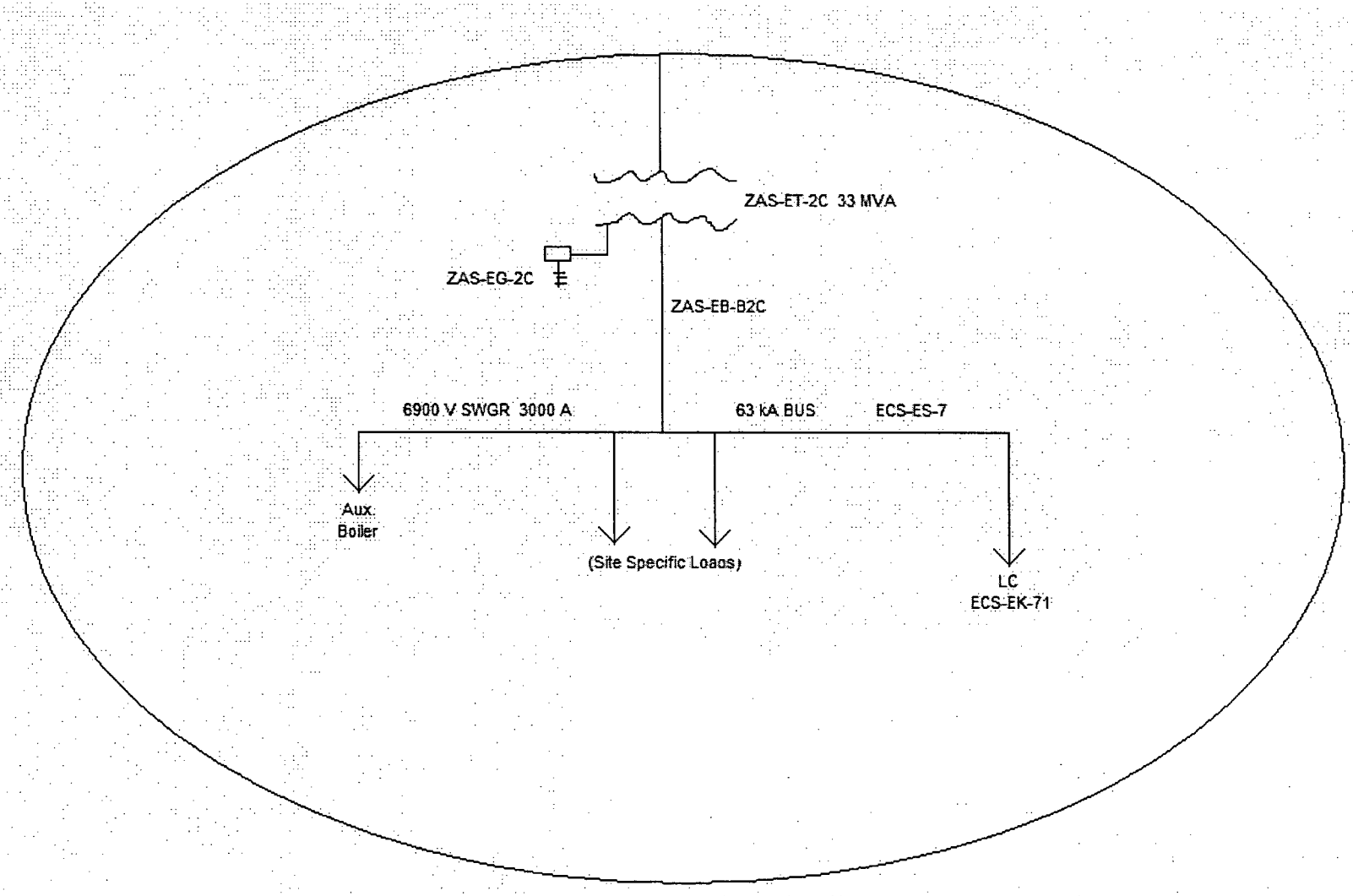

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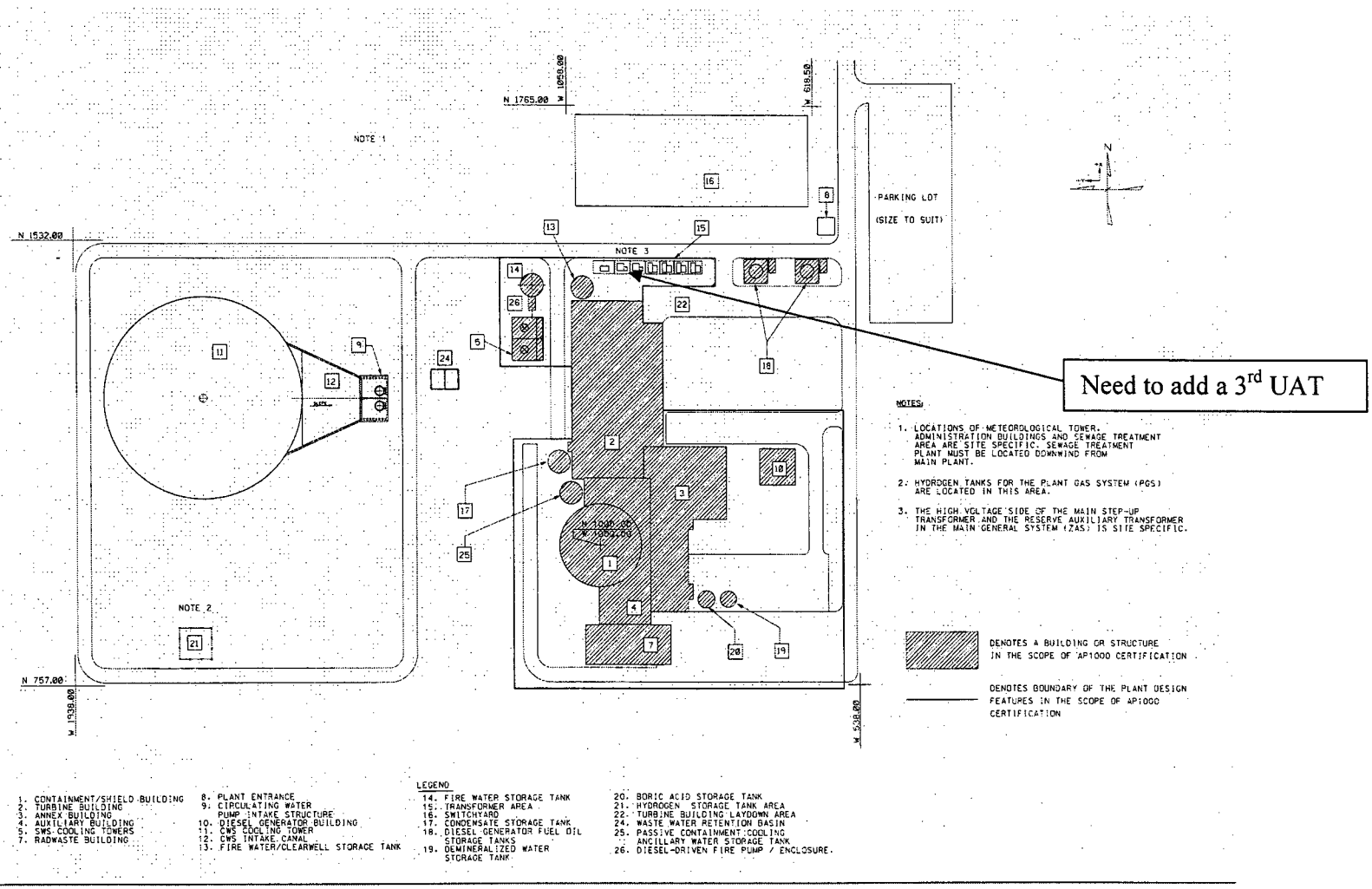


Figure 1.2-2

**Document Number:** APP-GW-GLN-114 **Revision Number:** 0

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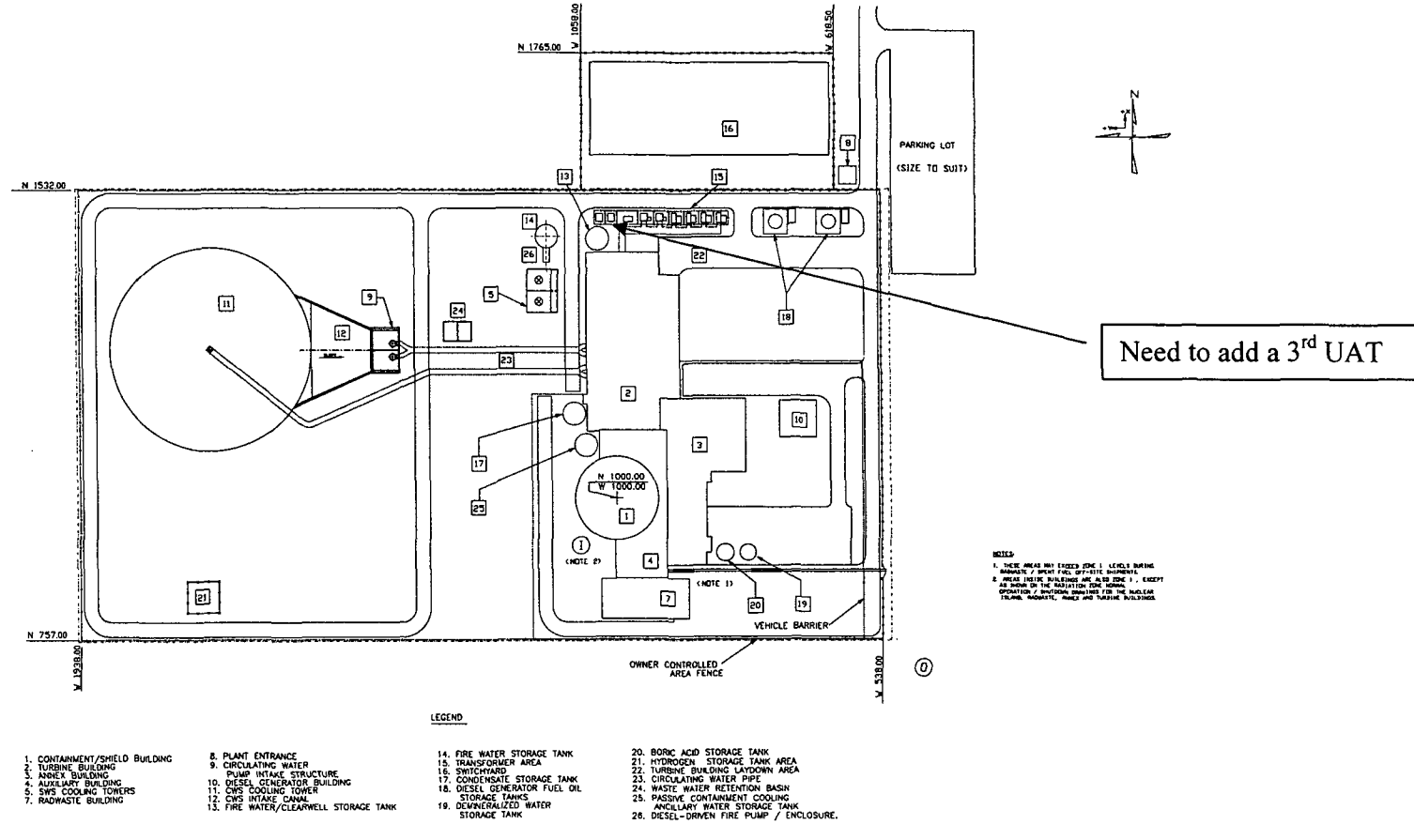


Figure 12.3-1 (Sheet 2 of 16)

**Site Radiation Zones, Normal Operations/Shutdown**

### 9.5.4 Standby Diesel ~~and Auxiliary Boiler~~ Fuel Oil System

This subsection describes the features of the standby diesel ~~and auxiliary boiler~~ fuel oil system. ~~Both t~~The standby diesel generators ~~and the auxiliary boiler~~ are supplied by a ~~combined~~ storage system of fuel oil storage tanks. Two above-ground fuel oil storage tanks for the ~~combined~~ system service are provided. These tanks store diesel grade fuel ~~suitable for either service.~~ The standby diesel generators are described in subsection 8.3.1.1.2 ~~and the auxiliary boiler is described in subsection 10.4.10~~.

#### 9.5.4.1 Design Basis

##### 9.5.4.1.1 Safety Design Basis

The standby diesel ~~and auxiliary boiler~~ fuel oil system serves no safety-related function and therefore has no nuclear safety design basis.

##### 9.5.4.1.2 Power Generation Design Basis

The standby diesel ~~and auxiliary boiler~~ fuel oil system serves no power generation function. Its function is to store and transfer fuel oil for the onsite standby diesel generators ~~and the auxiliary boiler~~. The system is designed to meet the following requirements:

- Provide a supply of fuel sufficient to operate each diesel generator at continuous rating for 7 days
- ~~Provide a 7-day fuel supply for auxiliary boiler operation, with half of the required fuel stored in each tank~~
- Provide a 4-day fuel supply for the two ancillary diesel generators

##### 9.5.4.1.3 Codes and Standards

The codes and standards that are applicable to the components of the Standby Diesel ~~and Auxiliary Boiler~~ Fuel Oil System that support the standby diesel generators are listed in Section 3.2. The ~~portions of the~~ Standby Diesel ~~and Auxiliary Boiler~~ Fuel Oil System ~~that support the standby diesel generators~~ follows the guidance for distillate fuel oil supply contained in Chapter 13 of the DEMA Standard Practices (Reference 19).

#### 9.5.4.2 System Description Storage and Transfer

##### 9.5.4.2.1 General Description

The standby diesel ~~and auxiliary boiler~~ fuel oil system is shown in Figure 9.5.4-1. The system consists of two fuel oil storage tanks, a diesel generator fuel oil transfer system, ~~an auxiliary boiler fuel oil supply system,~~ and an ancillary diesel generator fuel oil supply system.

Two fuel oil storage tanks are provided, one for each of the standby diesel generators. ~~Both tanks also provide fuel oil for the auxiliary boiler. Diesel fuel oil for the diesel generator is reserved by tapping auxiliary boiler fuel oil from elevated nozzles above the diesel generator storage level.~~

The plant finished grade elevation will be higher than the probable maximum flood level (refer to subsection 3.4.1.1, Protection From External Flooding). Therefore the system will be safe from flooding. The diesel generator fuel oil transfer system consists of two independent fuel storage, transfer and recirculation flow paths; that is, one path per diesel generator. Each path consists of a fuel oil storage tank, one fuel transfer pump, diesel fuel oil supply and fuel return piping, a day tank, and the associated specialties valves, fittings, and instrumentation. The supply lines from the transfer pumps to the daytanks include fuel oil heaters, filters and moisture separators. The system is protected from the effects of low temperatures by the inline electric oil heater in the transfer line.

~~The auxiliary boiler fuel oil supply portion of the system consists of a single supply line to the auxiliary boiler, two 100 percent capacity pumps each supplied by a fuel oil storage tank and a recirculation fuel oil return line from the boiler to the storage tanks.~~

The ancillary diesel generator fuel oil supply portion of the system consists of a single 100 percent capacity tank serving both ancillary diesel generators. The tank is located inside the annex building and is served by the annex building heating and ventilation system. The tank is insulated and provided with heaters to maintain the fuel oil above the oil cloud point. Fuel oil lines from the tank to the diesels are insulated.

Two separate prefabricated insulated, heated and ventilated weather enclosures are provided for the transfer systems. Each enclosure houses one diesel fuel oil transfer pump assembly~~ and one auxiliary boiler fuel oil transfer pump assembly~~. The enclosures are sufficiently separated to prevent a fire in either enclosure from causing an interruption in the other flow path.

Characteristics of the system components are provided in Table 9.5.4-1.

### 9.5.4.2.2 Component Description

#### 9.5.4.2.2.1 Fuel Storage Tanks

The two fuel oil storage tanks are located on grade. The tanks are designed and fabricated to API-650 Standards. Fittings are provided for each tank for level instrumentation, ventilation, sampling, water removal and sounding. Flanged openings are provided as manholes for access to the tank interior and each tank is equipped with an internal sump and a drain connection. Each tank is erected on a continuous concrete slab totally contained within a concrete dike to contain spills and prevent damage to the environment and seepage into the ground water.

~~The location and arrangement of the suction nozzles at the storage tank for the auxiliary boilers limit their fuel supply to the top section of the tank. The fuel stored below the level of the auxiliary boiler suction is reserved for the diesel generators, and cannot be taken by the auxiliary boiler fuel transfer pumps. The entire stored capacity of the tank can be used by the diesel generators, if necessary.~~

The design of the standby diesel ~~and auxiliary boiler~~ fuel oil system allows replenishment of fuel without interrupting operation of the diesel generator ~~or auxiliary boiler~~. The tank fill connection includes an

internal pipe and diffuser to limit inlet filling velocities to prevent turbulence of sediment on the bottom of the tank. In addition, the diesel fuel oil transfer connections at the fuel oil storage tanks are 6 inches above the tank bottom to reduce the potential of sediment entry into the pipe line. A moisture separator and duplex filters are provided in the diesel fuel oil piping and a duplex fuel oil filter is provided on each engine to prevent detrimental effects on diesel performance from sediment.

#### 9.5.4.2.2.2 Diesel Generator Fuel Oil Transfer

The diesel generator fuel oil transfer system consists of two modularized skid mounted assemblies, each consisting of suction strainers, a transfer pump, a fuel oil heater, a moisture separator, and a fuel filter with the interconnecting piping, valves and instrumentation.

The fuel oil transfer pumps are of the motor driven gear positive displacement type. Each pump capacity is approximately four times the full-load consumption rate of the associated diesel generator. The pump and pump motor are mounted on a common baseplate. A prefabricated weather enclosure protects the strainer, transfer pumps, heater, moisture separator, and duplex filters and associated piping. There is no fixed fire protection water system inside the enclosure; therefore, spurious actuation of a fire protection system cannot occur.

#### 9.5.4.2.2.3 Standby Diesel Generator Fuel Oil Day Tanks

The diesel generator fuel oil day tanks each provide four hours of operation for its associated diesel engine at continuous rating without resupply from a fuel oil storage tank. The day tanks are located within the diesel generator building and are separated from the remainder of the diesel generator building by 3-hour rated fire barriers. The day tanks are separate from sources of ignition or high-temperature surfaces. The day tank elevation is selected to provide the necessary suction head for the diesel engine fuel oil pump. The fuel oil piping is run in a piping trench from the tank to the engine. The fuel oil piping on the engine is located away from hot surfaces. Tank fittings provide for external tank fill, water removal, recirculation, and instrumentation. The fuel oil day tank is vented to atmosphere with a line which has a ball float check valve, and flame arrestor at the end. Since venting is to the outside atmosphere, there is not a buildup of combustible fumes within the diesel generator building.

#### 9.5.4.2.2.4 Ancillary Diesel Generator Fuel Oil Storage Tank

The ancillary diesel generator fuel oil storage tank provides four days of operation of the ancillary diesel generators. The tank is analyzed to show that it will withstand an SSE and is located in the same room as the ancillary diesel generators in the annex building. This room is separated from the rest of the annex building by a 3-hour rated fire barrier. The tank elevation is selected to provide the necessary head for the diesels. The ancillary diesel generator fuel oil storage tank is vented to the atmosphere with a line which has a ball float check valve, and flame arrestor at the end. Since venting is to the outside atmosphere, there is not a buildup of combustible fumes within the annex.

#### 9.5.4.2.2.5 Piping and Tank Surfaces

The exterior and interior surfaces of the fuel oil storage tanks are painted with a primer and finish coat system for corrosion protection of the tank surface. Exterior surfaces of the diesel fuel oil transfer piping ~~and the auxiliary boiler supply piping~~ are painted for corrosion protection. Buried sections are enclosed in guard pipes to prevent leakage to the environment.

The guard pipe containment system is corrosion resistant plastic, designed and fabricated for the site overburden wheel loads which result from equipment removal and replacement.

~~9.5.4.2.2.6 Auxiliary Boiler Fuel Oil Supply~~

~~The auxiliary boiler fuel oil supply system consists of two modularized skid mounted assemblies. Each consists of a suction strainer, supply pump and motor drive, and the associated piping, valves, fittings and instrumentation. The outdoor part of the system is designed to pump oil at ambient temperature for firing in the boiler. No special provisions are required for oil heating, moisture removal or filtration. One modularized skid mounted auxiliary boiler fuel oil supply assembly is installed in each diesel fuel oil transfer enclosure.~~

### 9.5.4.2.3 System Operation

The fuel oil storage tanks for the diesel generators ~~and auxiliary boiler~~ are replenished from trucks (or other mobile suppliers) as required to maintain ~~an adequate supply for the auxiliary boilers, and~~ a seven day supply for each standby diesel generator. Each storage tank is equipped with a vent line to atmosphere at the top of the tank that ends with a flame arrester. A tank fill line runs to each tank and is extended to the truck unloading station. The fill line incorporates a normally closed valve and a filler cap at the end to preclude the entrance of water. The fill line is above grade. The fill line has a strainer located downstream of the isolation valve to prevent entrance of deleterious solid material into the tank. A water removal port is located at the tank sump.

Each diesel oil transfer pump takes suction from a fuel oil storage tank and discharges fuel oil to the diesel generator fuel oil day tank. Each pump is capable of supplying its diesel generator and, simultaneously, increasing the inventory in the fuel oil day tank. The fuel oil transfer pump is automatically started and stopped on day tank level control. Part of the pump discharge flow is returned to the storage tank via the recirculation line. The filter in the discharge line to the day tank is monitored by measuring differential pressures across the filter and by providing a high differential pressure alarm.

~~Fuel oil to the auxiliary boiler is supplied by two suction supply lines, (one from each tank), to two separate fuel oil supply pumping stations. One auxiliary boiler fuel oil pumping station is located in each diesel generator fuel transfer pump enclosure. Each pumping station includes a full size duplex suction strainer in the suction line to the electric motor driven auxiliary boiler fuel oil gear type supply pump. Both pumps discharge to the auxiliary boiler through a common discharge line. The pumps are full capacity with one for service and the other as standby. The pump motor and pump are mounted on a common base plate. The system includes a recirculation fuel oil return line from the boiler back to the storage tanks.~~

In the event the diesel fuel oil degrades during storage, biocides and other fuel additives are introduced to the tanked fuel oil to prevent deterioration of the oil, accumulation of sludge in the storage tanks, and the growth of algae and fungi.

Site-specific conditions determine the requirements for oil supply and emergency fuel delivery. Provisions are included in the fuel oil storage tanks and day tanks to check and remove accumulated water.

The fuel oil storage tank for the ancillary diesel generators is replenished from trucks (or other mobile supplier) as required to maintain a 4-day supply for both ancillary diesel generators.

### 9.5.4.3 Safety Evaluation

The standby diesel ~~and auxiliary boiler~~ fuel oil system serves a defense in depth function and requires no nuclear safety evaluation.

### 9.5.4.4 System Evaluation

The standby diesel generator fuel oil transfer system supplies fuel oil to the diesel generators which provide defense in depth electric power for investment protection.

The fuel oil storage tanks are sized to provide sufficient capacity for seven days of operation for each standby diesel generator ~~and also for seven days of operation of the auxiliary boiler~~. Within this period, the operator can arrange for additional fuel to be delivered to the plant site. An independent fuel supply path consisting of a fuel storage tank, a day tank, strainer, transfer pump, piping, oil heater, oil filter, moisture separator and valves is provided for each diesel generator. Each pump is powered from the electrical bus on which the diesel generator it serves is connected. Failure of a pump or a diesel generator would not affect the operability of components in the other train.

Maintenance of the fuel oil temperature above the cloud point is achieved automatically on low temperatures by an electric fuel oil heater at the discharge of the transfer fuel oil pump and by burial of the transfer piping below the frostline. The fuel oil system can be maintained above the cloud point temperature with the system electric heater in service and operation in the recirculation mode (bypassing the day tank) back to the fuel oil storage tank. Above grade piping and inline equipment outdoors are insulated.

Electrical power supply for the diesel fuel oil transfer pumps and electric heater is from the associated diesel generator backed 480 V bus.

~~The auxiliary boiler fuel oil supply system supplies fuel to the auxiliary boiler for plant heating. Electric power supply for these pumps is provided from the onsite standby diesel generator backed 480 V ac distribution system.~~

The fuel oil storage tank for the ancillary diesel generators is sized to provide sufficient capacity for four days of operation for both ancillary diesel generators. The ancillary diesel generators are not needed for the first 72 hours following a loss of all ac. Therefore, the operator has seven days to arrange for additional fuel to be delivered to the plant site. Maintenance of the fuel oil temperature above the cloud point when a normal ac source is available is achieved by the normal annex building heating and ventilation system maintaining room temperature within its normal range. Maintenance of the fuel oil temperature above the cloud point during operation of the ancillary diesel generators is achieved by electric tank heaters and tank insulation.

### 9.5.4.5 Tests and Inspections

#### 9.5.4.5.1 Diesel Generator Fuel Oil Supply

The standby diesel generator fuel oil storage and transfer system operability may be demonstrated during tests of the diesel generator, or testing may be performed by operation of the system in recirculation mode (bypassing the day tank) and pumping fuel through the recirculation line back to the fuel oil storage tank. Fuel reserve for testing is supplied by sizing the storage tanks to contain fuel in excess of the volume required for seven days of operation at full load. Provisions are made to sample and analyze diesel fuel periodically to verify the fuel quality requirements.

~~**9.5.4.5.2 Auxiliary Boiler Fuel Oil Supply**~~

~~The auxiliary boiler fuel oil supply operability may be tested by pump operation through the recirculation line from the boiler back to the storage tank.~~

### 9.5.4.6 Instrumentation Applications

#### 9.5.4.6.1 Standby Diesel Generator Fuel Oil Supply

The transfer pumps can be operated from the control room. Alarms and indications of tank levels and transfer pump status are displayed in the control room. A secondary means of tank level determination is provided by dipsticks or sounding ports. Day tank fuel oil transfer pumps start and stop on low and high level, respectively, and the tank level transmitter activates a day tank high or low level alarm. The diesel oil transfer pumps start automatically when the level in the day tank decreases to set capacity. The day tank low level alarm annunciates when the level decreases to a point where 2 hours of fuel remain. The diesel oil transfer pumps are automatically stopped when the day tank level has increased to a higher set level.

Low fuel oil level in the standby diesel fuel oil storage tanks ~~section reserved for the diesel engines~~ is also alarmed.

~~**9.5.4.6.2 Auxiliary Boiler Fuel Supply**~~

~~The instrumentation associated with auxiliary boiler fuel oil supply is discussed in subsection 10.4.10. The system alarms on low fuel oil pressure due to loss of supply pump pressure, on low level in the fuel oil storage tanks and high differential pressure across the suction strainer.~~

#### 9.5.4.6.2 ~~3~~ Ancillary Diesel Generator Fuel Oil Supply

There is no control room monitoring or control associated with the ancillary diesel generator fuel oil supply system. All controls and instruments are local/manual only. Provision is made to locally monitor fuel level in the tank.

### 9.5.4.7 Combined License Information

Combined License applicants referencing the AP1000 certified design will address the site-specific need for cathodic protection in accordance with NACE Standard RP-01-69 for external metal surfaces of metal tanks in contact with the ground.

Combined License applicants referencing the AP1000 certified design will address site-specific factors in the fuel oil storage tank installation specification to reduce the effects of sun heat input into the stored fuel, the diesel fuel specifications grade and the fuel properties consistent with manufacturers' recommendations, and will address measures to protect against fuel degradation by a program of fuel sampling and testing.

Table 9.5.4-1 (Sheet 1 of 2)

NOMINAL COMPONENT DATA
STANDBY DIESEL ~~AND AUXILIARY BOILER~~ FUEL OIL SYSTEM

| | |
|---|---|
| **Above Ground Storage Tanks** | |
| Service | Diesel engine~~ and auxiliary boiler~~ supply |
| Quantity | 2 |
| Type | Vertical, cylindrical |
| Total **available fuel** capacity (gal) per tank | ~~85,000~~ 60,000 |
| **Available fuel** ~~Capacity~~ reserved for diesel generator (gal) per tank | 55,000 |
| Excess **fuel** ~~capacity~~ available for **testing** ~~auxiliary boiler~~ (gal) per tank | ~~30,000~~ 5,000 |
| Operating pressure | Atmospheric |
| Operating temperature | Ambient |
| **Diesel Oil Transfer System** | |
| **Fuel Oil Transfer Pumps** | |
| Quantity | 2 |
| Type | Gear, positive displacement |
| Operating Flow (gpm) | 8 |
| Required design capacity (gpm) | 30 |
| **Fuel Oil Strainer** | |
| Quantity | 2 |
| Type | Duplex |
| Design Capacity (gpm) | 30 |
| **Fuel Oil Heater** | |
| Quantity | 2 |
| Type | Electric |
| Rating @30 gpm | 90 kw |
| **Fuel Oil Water Separator** | |
| Quantity | 2 |
| Type | Pressurized/coalesced |
| Design Capacity (gpm) | 30 |
| **Duplex Filters** | |
| Quantity | 2 |
| Type | Duplex/stacked disc |
| Design Capacity (gpm) | 30 |
| **Diesel Fuel Oil Day Tanks** | |
| Quantity | 2 |
| Type | Horizontal, cylindrical |
| Minimum Design Capacity (gal) | 1300 |
| Available capacity (gal) | 1200 |
| Operating pressure | Atmospheric |
| Code | Non-Stamped ASME VIII |

Table 9.5.4-1 (Sheet 2 of 2)

**NOMINAL COMPONENT DATA**
**STANDBY DIESEL ~~AND AUXILIARY BOILER~~ FUEL OIL SYSTEM**

| | |
|---|---|
| **~~Auxiliary Boiler Supply System~~** | |
| **~~Fuel Oil Strainer~~** | |
| ~~Quantity~~ | ~~2~~ |
| ~~Type~~ | ~~Duplex~~ |
| ~~Design Capacity (gpm)~~ | ~~20~~ |
| **~~Fuel Oil Supply Pumps~~** | |
| ~~Quantity~~ | ~~2~~ |
| ~~Type~~ | ~~Gear, positive displacement~~ |
| ~~Design Capacity (gpm)~~ | ~~20~~ |
| **Ancillary Diesel Fuel Oil Tank** | |
| Quantity | 1 |
| Type | Horizontal, cylindrical |
| Minimum Design Capacity (gal) | 650 |
| Available capacity (gal) | 625 |
| Operating pressure | Atmospheric |
| Code | Non-Stamped ASME VIII |

Table 9.5.4-2

**INDICATING AND ALARM DEVICES - STANDBY DIESEL ~~AND AUXILIARY BOILER~~ FUEL SYSTEM**

| Parameter | Indication | | Alarm | |
|---|---|---|---|---|
| | Control Room | Local | Control Room | Local |
| Fuel Oil Storage Tank Level - Diesel Oil (DO) Transfer | Yes | Yes | Yes | Yes |
| ~~Auxiliary Boiler Supply Pump Motor-Running Indication~~ | ~~Yes~~ | ~~Yes(2)~~ | ~~Yes~~ | ~~Yes(2)~~ |
| DO Day Tank Level | Yes | Yes | Yes | Yes |
| DO Transfer Pump Motor-Running Indication | Yes | Yes | No | No |
| DO Low Fuel Oil Pressure | Yes | Yes | Yes(1) | Yes |
| ~~Auxiliary Boiler Supply Low Fuel Oil Pressure~~ | ~~Yes~~ | ~~Yes(2)~~ | ~~Yes(1)~~ | ~~Yes(2)~~ |
| DO Water Separator Differential Pressure | Yes | Yes | Yes(1) | Yes |
| DO Filter Differential Pressure | Yes | Yes | Yes(1) | Yes |
| DO Pump Suction Strainer Differential Pressure | Yes | Yes | Yes(1) | Yes |
| ~~Auxiliary Boiler Supply Pump Suction Strainer Differential Pressure~~ | ~~Yes~~ | ~~Yes(2)~~ | ~~Yes(1)~~ | ~~Yes(2)~~ |
| DO Fuel Oil Heater in Service | Yes | Yes | Yes(1) | Yes |
| DO Fuel Oil Heater Temp Out | Yes | Yes | Yes(1) | Yes |
| Fuel Oil Tank Fill Strainer Differential Pressure | No | Yes | No(1) | Yes |

**Notes:**
(1) Combined trouble alarm in control room
~~(2) Local indication or alarm at auxiliary boiler panel~~

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**Title:** AP1000 Aux. Boiler Sizing and Design

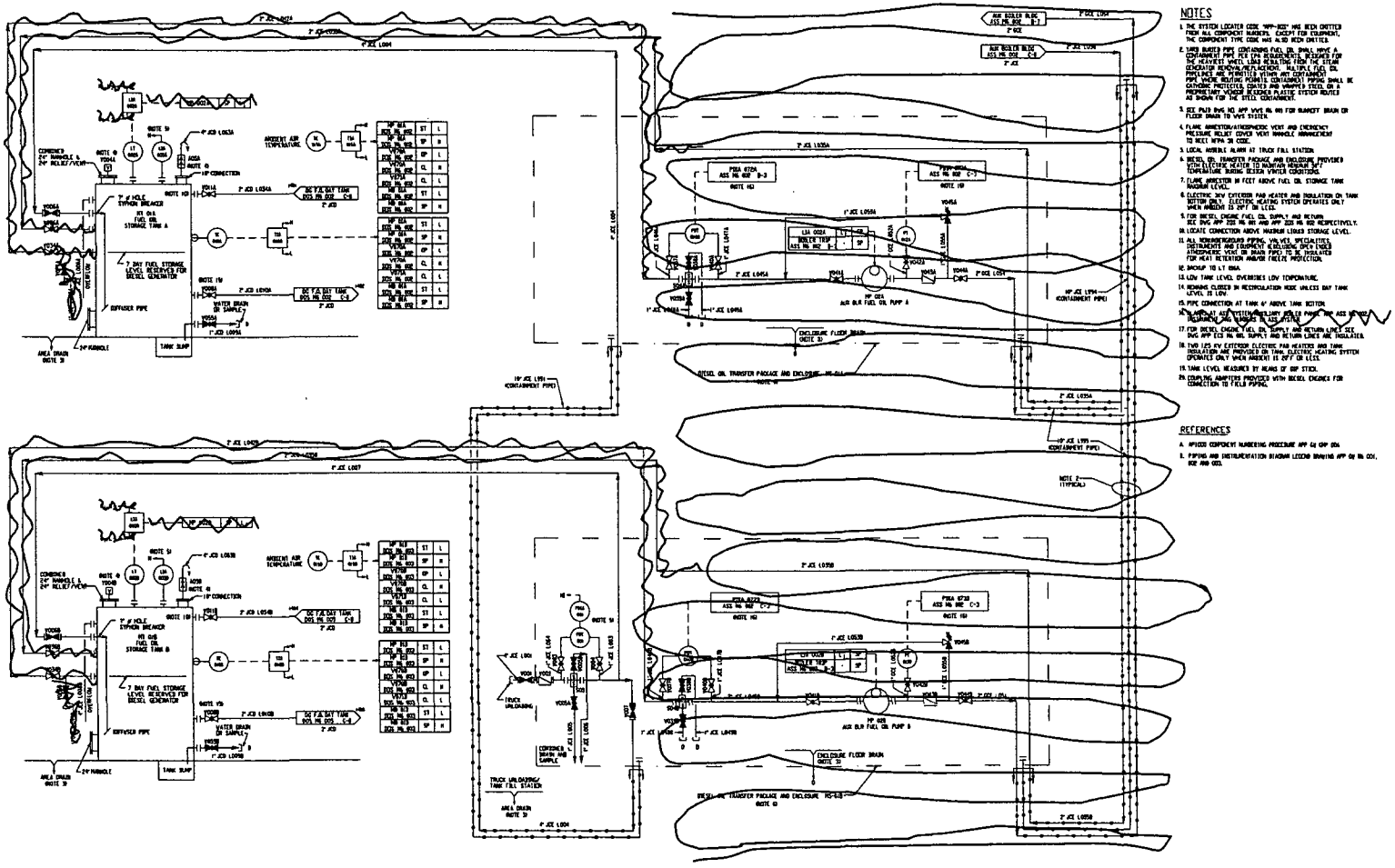
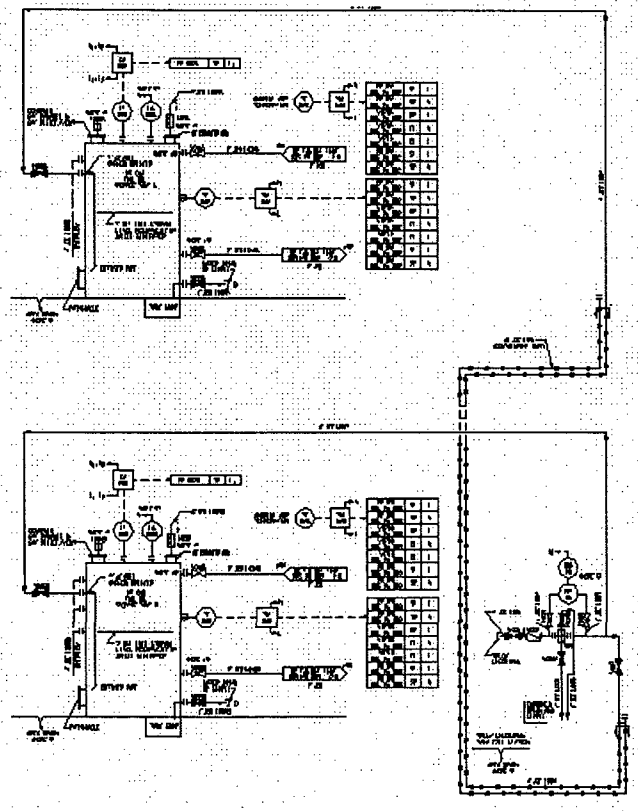



Figure 9.5.4-1 (Sheet 1 of 3)

**Standby Diesel ~~and Auxiliary Boiler Fuel~~ Oil System Piping and Instrumentation Diagram**
(REF) DOS 001



This is Figure 9.5.4-1 from the previous page with Aux. Boiler Fuel System Piping and Components Removed.

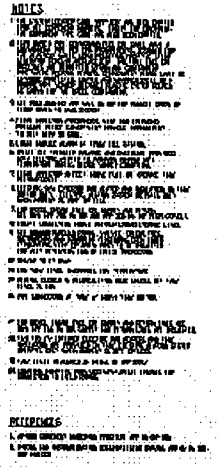


Figure 9.5.4-1 (Sheet 1 of 3)

**Standby Diesel ~~and Auxiliary Boiler Fuel~~ Oil System Piping and Instrumentation Diagram**
(REF) DOS 001

### 10.4.10 Auxiliary Steam System

The auxiliary steam system (ASS) provides the steam required for plant use during startup, shutdown, and normal operation. Steam is supplied from either the auxiliary boiler or the main steam system.

#### 10.4.10.1 Design Basis

##### 10.4.10.1.1 Safety Design Basis

The auxiliary steam system serves no safety-related function and therefore has no nuclear safety design basis.

##### 10.4.10.1.2 Power Generation Design Basis

The auxiliary steam system supplies steam required by the unit for a cold start of the main steam system and turbine-generator. Additionally, the auxiliary steam system provides steam for hot water heating. Main steam **supplements the auxiliary steam header during start up and** supplies the auxiliary steam header during normal operation. The **electric** auxiliary boiler provides steam to the header during plant **start up and** shutdown.

#### 10.4.10.2 System Description

##### 10.4.10.2.1 General Description

The auxiliary boiler is located in the turbine building. The system consists of steam generation equipment and distribution headers. **Electric power is supplied to the boiler by a 3rd UAT as described in section 8.3.1.**

Condensate from the condensate storage tank is chemically treated and pumped to the auxiliary boiler deaerator where oxygen and non-condensables are removed using auxiliary steam. **Water conductivity and level is controlled to facilitate boiling by the energized electrodes in the auxiliary boiler.** The auxiliary boiler feedwater pumps deliver condensate from the auxiliary boiler deaerator to the auxiliary boiler. A feedwater control valve, located in the feedwater piping, regulates water level in the auxiliary boiler. Feedwater flow is proportional to auxiliary boiler steaming rate. Steam generated by the auxiliary boiler is supplied to the plant auxiliary steam distribution piping.

Boiler water quality is maintained by controlling boiler blowdown flow to an atmospheric blowdown tank and by feeding oxygen scavenging and pH control chemicals to the boiler makeup water system.

Water level in the auxiliary boiler deaerator is maintained by an automatic control valve in the condensate supply and deaerator overflow piping. Makeup water is supplied from the demineralized water transfer and storage system.

### 10.4.10.2.2 Component Description

Auxiliary steam system component classification is as described in Section 3.2.

**Auxiliary Steam System and Boiler**

The auxiliary steam boiler is an ~~oil-fired~~ **electric** package boiler with a nominal net output capacity of ~~at least 110,000~~ **approximately 100,000** pounds per hour of saturated steam at 195 psig. The system is protected from overpressure by safety valves located on the boiler, boiler deaerator, and auxiliary steam header.

**Pumps**

Two 100-percent capacity auxiliary boiler feedwater pumps are provided to feed the auxiliary steam boiler.

Two 100-percent capacity auxiliary boiler makeup pumps maintain level in the boiler deaerator.

**Auxiliary Boiler Deaerator**

The auxiliary boiler deaerator is a 100-percent-capacity deaerator which uses steam supplied by the auxiliary steam header. The auxiliary boiler deaerator steam blanket is controlled for preheating and deaerating boiler makeup water. The auxiliary boiler deaerator removes oxygen and non-condensables from auxiliary boiler feedwater.

**Chemical Treatment Components**

The auxiliary boiler makeup water is treated with pH control and oxygen scavenging chemicals. Chemical injections maintain proper water chemistry during operational conditions. Batch chemicals for cleaning and layup are injected into the auxiliary boiler and auxiliary boiler deaerator when they are not in operation. Chemical feed equipment for the auxiliary steam system is part of the turbine island chemical feed system (CFS) and is described in Section 10.4.11.

~~**Auxiliary Boiler Fuel Oil Components**~~

~~Two 100-percent capacity positive displacement fuel oil pumps supply fuel oil to the auxiliary steam boiler. These pumps are part of the standby diesel and auxiliary boiler fuel oil system (DOS). As described in DCD subsection 9.5.4, these pumps supply fuel oil to the auxiliary boiler from the fuel oil storage tanks which are also part of the standby diesel and auxiliary boiler fuel oil system.~~

### 10.4.10.2.3 System Operation

When in operation, the auxiliary steam system provides the following services:

- Steam to the plant hot water heating system heat exchangers where water is heated and pumped to the heating system ventilation coils.
- Steam for the condensate system deaerator when condensate heating occurs during preoperational cleanup of the condensate and feedwater system
- Sealing steam to the glands of the main turbine prior to the availability of main steam
- Steam for maintaining pressure in the condensate system deaerator after a turbine trip when extraction steam is lost.
- Steam for blanketing of the MSR and feedwater heaters when main steam is not available.

Operational safety features are provided within the system for the protection of plant personnel and equipment. The auxiliary steam system does not interface directly with nuclear process systems.

**10.4.10.3 Safety Evaluation**

The auxiliary steam system has no safety-related function and therefore requires no nuclear safety evaluation. High energy pipe rupture analysis is not required for the auxiliary steam system since none of the lines pass through areas where safety related equipment is located.

**10.4.10.4 Tests and Inspections**

Testing of the auxiliary steam system is performed prior to initial plant operation. Components of the system are monitored during operation to verify satisfactory performance.

**10.4.10.5 Instrumentation Applications**

A boiler control system is provided with the auxiliary boiler package for automatic control of the auxiliary boiler. Features of the control system include automatic shutdown of the auxiliary boiler ~~and auxiliary boiler fuel oil pumps~~ on an abnormal condition.

The auxiliary steam system is provided with the necessary controls and indicators for local or remote monitoring of the operation of the system.

### 9A.3.2.6 Fire Area 2003 AF 01

This fire area is comprised of the following room(s):

| Room No. | |
|---|---|
| 20304 | Auxiliary boiler room |

There are no systems in this fire area which contain radioactive material.

**Fire Detection and Suppression Features**

Fire detectors
- Wet pipe sprinklers
- Hose station(s)

Portable fire extinguishers

**Smoke Control Features**

Local heating and ventilation for the auxiliary boiler room is supplied by the turbine building ventilation system (VTS) as described in DCD subsection 9.4.9. During normal operation, exhaust ventilators mounted on an exterior wall pull air in from the turbine building through wall louvers and maintain the auxiliary boiler room at a lower pressure than turbine building general areas. Fire dampers close automatically on high temperature to control the spread of fire and smoke. Following a fire, the exhaust ventilators, if available, can be used to vent smoke to outside the turbine building.

**Fire Protection Adequacy Evaluation**

A fire in this area is detected by a fire detector which produces an audible alarm locally with both visual and audible alarms in the main control room and security central alarm station. The fire is extinguished by the automatic suppression system or manually, using hose streams or portable extinguishers.

Combustible materials in this fire area are listed in Table 9A-3. Due to the concentration of ~~fuel oil and lubricating oil~~ combustible material, this fire area is an ~~extra~~ ordinary hazard fire area. The fire area has a moderate concentration of combustibles, with moderate heat release rates. ~~This area has a high combustible loading and fires with high heat release rates could develop rapidly. Therefore, an automatic fire suppression system is provided.~~ The ~~3~~ 2-hour fire barriers that separate this fire area from the rest of the turbine building provide sufficient separation to prevent the fire from propagating beyond the fire area. The ceiling for this fire area will be a 3-hour rated barrier for increased protection to the electrical switchgear located on the floor above.

~~The west wall of the auxiliary boiler room is part of the exterior wall of the turbine building. Due to the explosion hazard associated with an oil fired boiler, this wall contains blowout panels to relieve the pressure of an explosion to outside the turbine building.~~

The auxiliary boiler room ventilation system portion of the turbine building ventilation system does not contribute to the spread of the fire or smoke to other fire areas. Fire area boundaries are equipped with fire dampers to prevent the propagation of fire between fire areas.

TABLE 9A-3 (SHEET 13 OF 22)
**FIRE PROTECTION SUMMARY**

| Fire Area/ Zone[1] | Safety Area?[2] | Floor Area Sq Ft | Combust. Material[3] | Fire Sev. Cat. | Amount | Heat Value (Btu) | Comb. Load, Btu/ Sq Ft | Equiv. Dur. (Min) | Boundary Fire Res.[4] (Hours) | Detect. Cap. | Fixed Suppression Capability[5] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2053 AF 20506 | | | CABLE INS | C | 250 | 2.6E+06 | | | | SMOKE | HOSE STATION |
| VFD POWER | | | PLASTIC | D | 500 | 6.5E+06 | | | | | |
| CONVERTER ROOM | | | TRASH | B | 25 | 2.0E+05 | | | | | |
| | | 3634 | NET CAT. | D | TOTAL: | 9.2E+06 | 15100 | 12 | | | |
| 2057 AF 20503 | | | CABLE INS | C | 2000 | 2.0E+07 | | | | HEAT | WATER SPRAY |
| GENERATOR SEAL | | | LUBE OIL | E | 400 | 6.0E+07 | | | | | HOSE STATION |
| OIL UNIT | | | PLASTIC | D | 300 | 4.0E+06 | | | | | |
| | | | VOLATILES | E | 55 | 7.5E+06 | | | | | |
| | | | TRASH | B | 200 | 1.5E+06 | | | | | |
| | | 144 | NET CAT. | E | TOTAL: | 9.4E+07 | 651000 | 488 | | | |
| 2060 AF 20600 | | | CABLE INS | C | 1000 | 1.0E+07 | | | | HEAT | ~~WET PIPE~~ |
| ELEVATION 161'-0" | | | LUBE OIL | E | 250 | 3.8E+07 | | | | | ~~SPRINKLERS~~ |
| GENERAL FLOOR AREA | | | PLASTIC | D | 2500 | 3.3E+07 | | | | | HOSE STATION |
| | | | VOLATILES | E | 55 | 7.5E+06 | | | | | |
| | | | TRASH | B | 1000 | 7.7E+06 | | | | | |
| | | 44042 | NET CAT. | E | TOTAL: | 9.6E+07 | 2200 | 2 | | | |
| 2063 AF 20601 | | | CABLE INS | C | 600 | 6.1E+06 | | | | SMOKE | HOSE STATION |
| TOOL ROOM/ | | | PAPER | C | 600 | 4.6E+06 | | | | | |
| STORAGE AREA | | | PLASTIC | D | 600 | 7.9E+06 | | | | | |
| | | | RUBBER | D | 100 | 1.2E+06 | | | | | |
| | | | TRASH | B | 50 | 3.9E+05 | | | | | |
| | | 368 | NET CAT. | D | TOTAL: | 2.0E+07 | 55000 | 43 | | | |
| 2063 AF 20602 | | | CABLE INS | C | 250 | 2.6E+06 | | | | SMOKE | HOSE STATION |
| OFFICE AREA/ | | | PAPER | C | 1200 | 9.2E+06 | | | | | |
| ENGINEERING | | | PLASTIC | D | 600 | 7.9E+06 | | | | | |
| WORKSTATION | | | RUBBER | D | 100 | 1.2E+06 | | | | | |
| | | | TRASH | B | 50 | 3.9E+05 | | | | | |
| | | 368 | NET CAT. | D | TOTAL: | 2.1E+07 | 58000 | 46 | | | |
| FIRE AREA TOTAL: | | 176358 | NET CAT. | E | TOTAL: | 3.6E+09 | 21000 | 15 | | | |
| **2000 AF 02** | NO | | | | | | | | 2 | NONE | NONE |
| STAIRWELL S02 | | NEGLIGIBLE | | | | | | | | | |
| **2003 AF 01** | NO | | | | | | | | ~~32~~/0 | HEAT | ~~WET PIPE~~ ~~SPRINKLER~~ |
| AUXILIARY BOILER | | | ~~FUEL OIL~~ | ~~E~~ | ~~2000~~ | ~~2.9E+08~~ | | | | | HOSE STATION |
| ROOM | | | CABLE INS | C | 1600 | 1.6E+07 | | | | | |
| | | | LUBE OIL | E | 100 | 1.5E+07 | | | | | |
| | | | PLASTIC | D | 1000 | 1.3E+07 | | | | | |
| | | | TRASH | B | 1000 | 7.7E+06 | | | | | |
| | | | VOLATILES | E | 250 | 3.4E+07 | | | | | |
| FIRE AREA TOTAL: | | 1940 | NET CAT. | ~~E~~ C | TOTAL: | ~~3.7E+08~~ 8.6E07 | | ~~193000~~ 44500 | | ~~145~~ 47 | |
| **2009 AF 01** | NO | | | | | | | | 2 | NONE | NONE |
| STAIRWELL S01 | | | NEGLIGIBLE | | | | | | | | |

## 5.0 REGULATORY IMPACT

A. FSER IMPACT

There is no impact on the FSER. The changes to the condenser design have no effect on design function of the condenser. This change has no effect on Tier 1 information.

B. SCREENING QUESTIONS (Check correct response and provide justification for that determination under each response)

1. Does the proposed change involve a change to an SSC that adversely affects a DCD described design function? ☐ YES ☒ NO

   There is no change to a design function of any safety related equipment.

2. Does the proposed change involve a change to a procedure that adversely affects how DCD described SSC design functions are performed or controlled? ☐ YES ☒ NO

   The design change has no effect on any SSC.

3. Does the proposed activity involve revising or replacing a DCD described evaluation methodology that is used in establishing the design bases or used in the safety analyses? ☐ YES ☒ NO

   The design change does not require changes to the evaluation of the response to any postulated accident conditions. The changes to the design do not require changes to the structural or safety analysis of any safety related equipment.

4. Does the proposed activity involve a test or experiment not described in the DCD, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the DCD? ☐ YES ☒ NO

   The design change does not require an additional test or experiment or changes to testing.

C. EVALUATION OF DEPARTURE FROM TIER 2 INFORMATION (Check correct response and provide justification for that determination under each response)

10 CFR Part 52, Appendix D, Section VIII. B.5.a. provides that an applicant for a combined licensee who references the AP1000 design certification may depart from Tier 2 information, without prior NRC approval, if it does not require a license amendment under paragraph B.5.b. The questions below address the criteria of B.5.b.

**Document Number:** APP-GW-GLN-114 **Revision Number:** 0

**Title:** AP1000 Aux. Boiler Sizing and Design

| | |
|---|---|
| 1. Does the proposed activity result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the plant-specific DCD? | ☐ YES ☒ NO |
| There are no new accident initiators and no effect on the frequency of evaluated accidents. | |
| 2. Does the proposed activity result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety and previously evaluated in the plant-specific DCD? | ☐ YES ☒ NO |
| There is no effect on malfunctions of structures, systems, or components. | |
| 3. Does the proposed activity result in more than a minimal increase in the consequences of an accident previously evaluated in the plant-specific DCD? | ☐ YES ☒ NO |
| The design change has no effect on the operation, performance, and pressure boundary integrity of the safety related equipment. Therefore, there is no increase in the calculated release of radioactive material during postulated accident conditions. | |
| 4. Does the proposed activity result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the plant-specific DCD? | ☐ YES ☒ NO |
| The design change has no effect on the design functions or reliability of the safety related systems, structures or components. Therefore, there is no increase in the calculated consequences due to a malfunction of an SSC. | |
| 5. Does the proposed activity create a possibility for an accident of a different type than any evaluated previously in the plant-specific DCD? | ☐ YES ☒ NO |
| The design changes do not introduce any additional failure modes; therefore, there is no possibility of an accident of a different type than any evaluated previously in the DCD. | |
| 6. Does the proposed activity create a possibility for a malfunction of an SSC important to safety with a different result than any evaluated previously in the plant-specific DCD? | ☐ YES ☒ NO |
| The design changes have no effect on the design functions of the safety related systems, structures or components. There are no additional failure modes or the possibility for a malfunction of an SSC important to safety with a different result than any evaluated previously. | |
| 7. Does the proposed activity result in a design basis limit for a fission product barrier as described in the plant-specific DCD being exceeded or altered? | ☐ YES ☒ NO |
| There is no change to the design function of the safety related equipment or fission product barrier. | |
| 8. Does the proposed activity result in a departure from a method of evaluation described in the plant-specific DCD used in establishing the design bases or in the safety analyses? | ☐ YES ☒ NO |
| There is no change to any methodologies used within the DCD. | |

| |
|---|
| ☒ The answers to the evaluation questions above are "NO" and the proposed departure from Tier 2 does not require prior NRC review to be included in plant specific FSARs as provided in 10 CFR Part 52, Appendix D, Section VIII. B.5.b |
| ☐ One or more of the answers to the evaluation questions above are "YES" and the proposed change requires NRC review. |

D. IMPACT ON RESOLUTION OF A SEVERE ACCIDENT ISSUE

10 CFR Part 52, Appendix D, Section VIII. B.5.a. provides that an applicant for a combined licensee who references the AP1000 design certification may depart from Tier 2 information, without prior NRC approval, if it does not require a license amendment under paragraph B.5.c. The questions below address the criteria of B.5.c.

| | |
|---|---|
| 1. Does the proposed activity result in an impact features that mitigate severe accidents. If the answer is Yes answer Questions 2 and 3 below. | ☐ YES ☒ NO |
| The systems and components identified in the DCD Subsection 1.9.5 and Appendix 19 B that mitigate severe accidents are not impacted by the design change. | |
| 2. Is there is a substantial increase in the probability of a severe accident such that a particular severe accident previously reviewed and determined to be not credible could become credible? | ☐ YES ☐ NO ☒ N/A |
| | |
| 3. Is there is a substantial increase in the consequences to the public of a particular severe accident previously reviewed? | ☐ YES ☐ NO ☒ N/A |
| | |

| |
|---|
| ☒ The answers to the evaluation questions above are "NO" or are not applicable and the proposed departure from Tier 2 does not require prior NRC review to be included in plant specific FSARs as provided in 10 CFR Part 52, Appendix D, Section VIII. B.5.c |
| ☐ One or more of the he answers to the evaluation questions above are "YES" and the proposed change requires NRC review. |

E. SECURITY ASSESSMENT

1. Does the proposed change have an adverse impact on the security assessment of the AP1000. ☐ YES ☒ NO

The design change will not alter barriers or alarms that control access to protected areas of the plant. The design changes will not alter requirements for security personnel; therefore, the design change does not have an adverse impact on the security assessment of the AP1000.

## 6.0 REFERENCES

1. APP-GW-GL-700, AP1000 Design Control Document, Revision 15.