1.2 General Plant Description

The information in this section of the reference ABWR DCD, including all subsections, tables, and figures, is incorporated by reference with the following departures and supplements.

STD DEP T1 2.3-1

STD DEP T1 2.4-3

STD DEP T1 2.14-1 (Figures 1.2-2 and 1.2-8)

STD DEP T1 3.4-1

STP DEP 1.1-2 (Figure 1.2-1)

STD DEP 1.2-1

STP DEP 1.2-2 (Figures 1.2-24 through 1.2-37)

STD DEP 3.8-1 (Figures 1.2-23a through 1.2-23e)

STD DEP 8.3-1

STD DEP 9.1-1

STD DEP 9.4-3

STD DEP 9.4-4

STP DEP 10.2-1

STP DEP 10.4-2

STD DEP 10.4-6

STD DEP 11.4-1

STD DEP Admin

1.2.1.3 Plant Design and Aging Management

The following site-specific supplement addresses COL License Information Item 1.1a.

Because the design life for the ABWR is 60 years (40 years for the initial license condition plus anticipated renewal requests), steps are initiated in the design process to aid in the application, selection and procurement of components with optimum design life characteristics, and to maintain the plant's original design basis throughout its life.

Design Life

To achieve design life objectives, the following general design considerations are incorporated into design processes and practices:

- Design margins: Adequate margins are included in the original design to prevent unplanned reanalysis and possible modifications when deviation from the design value occurs during the equipment manufacture or construction.
- Water quality: The water quality requirements are used in the material selection and design of the water treatment systems, water storage systems, and associated water containing systems. The operating limits contained in the water quality requirements are provided to help prevent corrosion and cracking of reactor internals and to reduce the corrosion products produced from water containing systems. These requirements are specified in the procurement documents.
- Materials: Materials and process requirements are specified in procurement documents to prevent intergranular stress corrosion cracking (IGSCC) of austenitic stainless steel in mechanical systems. In addition, materials and process requirements considering prior BWR experience are specified in hardware designs and component procurement documents to provide for required fracture toughness.
- Corrosion design requirements: equipment design, material selection, and water chemistry are important to minimize both internal and external erosion and corrosion at the temperature, moisture content, and velocity of the fluids being processed. General corrosion allowance is used with additional margin in the design, and other corrosion mechanisms such as flow-accelerated corrosion are also considered.

Additional practices that are implemented to support a 60-Year ABWR Plant Design life include:

- Condition monitoring provides data to trend SSC performance so that deterioration of structures or components may be detected before the loss of an intended design function. Condition monitoring also consists of visual or non-destructive testing inspections for structures and passive type components.
- ABWR design features provide a high confidence that the cumulative plant and system transients will be kept well within the limits of occurrences as designed. ABWR plant operating events and dynamic loading events are summarized in Table 3.9-1 of the FSAR. The design requirements of the safety-related piping and equipment subjected to specific applicable thermal hydraulic transients derived from the system behavior during the events listed in this table are documented in design specifications and/or stress reports of the respective equipment.
- Instrument and Control (I&C) systems and components are designed to ensure system performance monitoring and system functions can be achieved. Sequencing of events recording capability enables plant personnel to evaluate the

plant transients quickly. The transient recording and analyses allows retrieval of data for post-trip root cause analysis and to support system testing. Recording capabilities and installed instruments enables operators to monitor and trend significant transients over the design lifetime.

- The environmental conditions applicable to safety-related mechanical and electrical equipment and qualification tests are described in Section 3.1 1 of FSAR. Environmental conditions for the areas where safety-related equipment are located are calculated for normal, abnormal, test, and post-accident conditions and are documented in Appendix 31 of FSAR.

- System design documentation contains a system description and intended function, interfaces/boundaries, environment, and requirements that major components have to meet. The documentation also provides design life, environmental limits, acceptance criteria for condition indicators, the description of the material for system equipment and piping, and control equipment and devices. The locations of the equipment, piping and control devices, environmental and seismic conditions for these components are also included.

Equipment and component design life requirements are to be incorporated into equipment purchase specifications. The purchase specifications specify the component design life requirements, applicable expected transients in the design life, environmental conditions to which the equipment will be exposed during plant operation, and properties of the working fluid, to allow the equipment supplier to evaluate the design life of their supplied equipment.

Equipment suppliers are required to provide the recommended frequencies of replacement and/or maintenance activities for any component for which the design life is less than 60 years. These recommended replacement and maintenance activities are considered as inputs to develop the preventive maintenance program.

Design Life Maintenance

Plant operational components and equipment, except the reactor vessel, are designed to be replaceable, design life not withstanding. Normal operational and maintenance practices and programs provide for monitoring, preventive and corrective refurbishment and repair, as appropriate, to assure that the design life of the plant is achieved.

The following programs provide the means for maintaining requirements and monitoring the performance or condition of SSCs against established goals to provide reasonable assurance: 1) that design life requirements and critical attributes of SSCs are documented and maintained, 2) that SSCs are capable of performing their intended function, and 3) that they are at acceptable levels of safety, thermal, and economic performance.

- Configuration Management Program

- Records Management Program

- Inservice Test and Inspection Program
- Check Valve Program
- Motor-Operated Valve Program
- Air Operated Valve Program
- Containment Leakage Test Program
- Erosion/Corrosion Program
- Environmental Qualification Program
- Individual Plant Examination/Probabilistic Risk Assessment
- Structural Monitoring Program
- Maintenance Rule Program
- Plant Performance Monitoring Program
- Surveillance Test Program
- Preventive Maintenance Program
- Radioactive Effluent Monitoring Program
- Chemistry Analysis
- Fatigue Management Program
- Flow Accelerated Corrosion Program

Aging Management

Because the initial license term is for 40 years, an aging management plan which implements the provisions described in NUREG-1801, Generic Aging Lessons Learned (GALL) Report, will be initiated to support license renewal submittal.

Aging management covers containment structures, liner plates, embedded or buried structure components, piping and components. Aging management for long-lived passive structures and components includes information regarding the materials of construction, potential causes of corrosion, environment, aging effects requiring management, and aging management activities to monitor and to control aging effects.

Aging management follows GALL established AMPS to monitor the long-lived passive components, or acceptable alternatives thereto. The time limited aging analysis (TLAA) programs described in GALL or alternatives will be monitored and trended to ensure the component or structure design limits are not exceeded. Because of ABWR

design life is 60 years, the evaluation for time limited aging analyses (TLAA) programs as described in NUREG-1 801 is not required.

References

EPRI Utility Requirement Document Section 1 1.3, Volume 11, Chapter 1, Design Life

NUREG-1801, Generic Aging Lessons Learned (GALL) Report

NUREG/CR-4731 and 5314, USNRC Nuclear Plant Aging Research (NPAR) Program

1.2.2.1.1 Site Location

STD DEP Admin

The information in this subsection of the reference ABWR is incorporated by reference with the following site-specific supplement.

STP 3 & 4 are located on the existing South Texas Project (STP) site. The 12,220 acre site is located in a rural area of south central Matagorda county. STP 3 & 4 are located near the Main Cooling Reservoir which has sufficient capacity to serve as main condenser heat sink. The Colorado River provides makeup water to the Main Cooling Reservoir.

1.2.2.1.2.3 Geology and Seismology

The information in this subsection of the reference ABWR is incorporated by reference with the following site-specific supplement.

The Ultimate Heat Sink and Reactor Service Water Piping Tunnel are designed to the site-specific SSE acceleration.

1.2.2.1.3 Site Arrangements

STD DEP 1.2-2

The containment and building arrangements, including equipment locations, are shown in Figures 1.2-2 through 1.2-37. The arrangement of these structures on the plant site is shown in Figure 1.2-1.

1.2.2.2.2.1 ~~1.2.2.2.3.1~~Main Steamline Isolation Valves

STD DEP T1 2.3-1

All pipelines that both penetrate the containment and offer a potential release path for radioactive material are provided with redundant isolation capabilities. Isolation valves are provided in each main steamline to isolate primary containment upon receiving an automatic or manual closure signal. Each is powered by both pneumatic pressure and spring force. These valves ~~fulfill the following objectives:~~ prevent excessive damage to the fuel barrier by limiting the loss of reactor coolant from the reactor vessel resulting from either a major leak from the steam piping outside the containment or a

malfunction of the pressure control system resulting in excessive steam flow from the reactor vessel.

~~(1) *Prevent excessive damage to the fuel barrier by limiting the loss of reactor coolant from the reactor vessel resulting from either a major leak from the steam piping outside the containment or a malfunction of the pressure control system resulting in excessive steam flow from the reactor vessel.*~~

~~(2) *Limit the release of radioactive materials by isolating the RCPB in case of the detection of high steamline radiation.*~~

1.2.2.3.10 Steam Bypass and Pressure Control System

STD DEP 10.4-6

A turbine bypass system is provided which passes steam directly to the main condenser under the control of the pressure regulator. Steam is bypassed to the condenser whenever the reactor steaming rate exceeds the load permitted to pass to the turbine generator. The turbine bypass system has the capability to shed ~~40%~~ 33% of the turbine-generator rated load without reactor trip or operation of safety/relief valves. The pressure regulation system provides main turbine control valve and bypass valve flow demands so as to maintain a nearly constant reactor pressure during normal plant operation. It also provides demands to the recirculation system to adjust power level by changing reactor recirculation flow rate.

1.2.2.3.11 ~~*Process*~~ Plant *Computer* Functions (*Includes ~~PMCS,~~* PGCS)

STD DEP T1 3.4-1

Online plant computer functions ~~*process computers*~~ *are provided to monitor and log process variables and make certain analytical computations. The performance and power generation control systems are included*.

1.2.2.3.13 CRD Removal Machine Control Computer

STD DEP 9.1-1

The CRD handling equipment local operation panel ~~*machine control computer*~~ *provides automatic positioning, continuous operation and prevention of erroneous operation in the stepwise removal and installation of CRDs from the remote control room.*

1.2.2.4.3 Containment Atmospheric Monitoring System

STD DEP T1 2.14-1

The Containment Atmospheric Monitoring System (CAMS) measures, records and alarms the radiation levels and the oxygen and hydrogen concentration levels in the primary containment under post-accident conditions. ~~It is automatically put in service upon detection of LOCA conditions.~~ Hydrogen and oxygen monitors are no longer required to mitigate design basis accidents.

1.2.2.5.3 Leak Detection and Isolation System

STD DEP T1 2.14-1

~~(10) Isolates the flammability control system lines~~

(~~11~~ 10) Isolates the drywell sumps drain lines

(~~12~~ 11) Isolates the fission products monitor sampling and return lines

(~~13~~ 12) Initiates withdrawal of the automated traversing incore probe

1.2.2.5.4 Reactor Core Isolation Cooling System

STD DEP T1 2.4-3

The RCIC System provides makeup water to the reactor vessel when the vessel is isolated and is also part of the emergency core cooling network. The RCIC System uses a steam-driven turbine-pump unit and operates automatically in time and with sufficient coolant flow to maintain adequate water level in the reactor vessel for events defined in Section 5.4.

One division contains the RCIC System, which consists of a steam-driven turbine-~~which drives a~~ pump assembly and the turbine and pump accessories. The system also includes piping, valves, and instrumentation necessary to implement several flow paths. The RCIC steam supply line branches off one of the main steamlines (leaving the RPV) and goes to the RCIC turbine with drainage provision to the main condenser. The turbine exhausts to the suppression pool with vacuum breaking protection. Makeup water is supplied from the condensate storage tank (CST) or the suppression pool with preferred source being the CST. RCIC pump discharge lines include the main discharge line to the feedwater line, a test return line to the suppression pool, and *a minimum flow bypass line to the suppression pool ~~and a cooling water supply line to auxiliary equipment~~.*

Following a reactor scram, steam generation in the reactor core continues at a reduced rate due to the core fission product delay heat. The turbine condenser and the feedwater system supply the makeup water required to maintain reactor vessel inventory.

1.2.2.5.5 ~~Reactor Core Isolation Cooling System~~

~~STD DEP T1 2.4-3~~

1.2.2.8.6 ~~*Multiplexing System*~~ Data Communication

STD DEP T1 3.4-1

Data communication is accomplished through multiple~~The Multiplexing System provides redundant and distributed~~ *control and instrumentation data communications* ~~networks to~~functions that *support the monitoring and control of interfacing plant systems. The* equipment ~~system~~ *includes electrical devices and circuitry* ~~(such as multiplexing units, bus controllers, formatters and data buses)~~ *that connect sensors, display devices, controllers, and actuators which are part of these plant systems. The* data ~~commuication~~ communication function ~~Multiplexing System~~ *also includes the associated data acquisition and communication software required to support its function of plant-wide data and control distribution.*

1.2.2.10.13 Solid Waste Management System

STD DEP 11.4-1

The Solid Waste Management System provides for the safe handling, packaging, and short-term storage of radioactive solid and concentrated liquid wastes that are produced. ~~Wet waste processed by this system is transferred to the solidification system, where it is solidified in containers.~~ *Dry active waste is surveyed and disposed of whenever possible via the provisions of* ~~10 CFR 20.302 (a)~~applicable Federal and State regulations. ~~The remaining combustible waste is compacted. Incinerator ash is compacted waste and shipped in containers for offsite disposal.~~ Refer to Section 11.4 for a complete description of the solid waste management system.

1.2.2.11.16 Generator

STP DEP 10.2-1

The generator is a direct-driven, three-phase, 60 Hz, ~~27~~approximately 26 kV, ~~188.5 rad/s~~1800 rpm, *conductor cooled, synchronous generator rated at approximately* ~~1600~~1610 *MVA, at 0.90 power factor,* ~~537.4~~ 520 *kPaG hydrogen pressure, and* ~~0.60~~ approximately 0.5 *short circuit ratio.*

1.2.2.11.20 Exciter

STP DEP 10.2-1

The generator exciter is ~~driven by the main turbine~~ a static excitation system *and will have a response ratio that meets the plant voltage regulation requirements and the site specific grid requirements.*

Excitation power is provided by the output of a dedicated ~~winding located in the main generator~~ transformer. *This output is rectified by* ~~the stationary silicon diode~~thyristor *rectifiers. The DC output of the rectifier banks then is applied to the main generator field through the generator collectors.*

1.2.2.11.21 Main Condenser

STP DEP 10.4-2

The main condenser is a ~~multipressure~~ single-pressure*, three-shell deaerating type condenser ~~or single pressure design as dictated by the site specific circulating water system and power generating heat sink~~. During plant operation, steam expanding through the low pressure turbines is directed downward into the main condenser and is condensed. The main condenser also serves as a heat sink for the turbine bypass system, emergency and high level feedwater heater and drain tank dumps, and various other startup drains and relief valve discharges.*

1.2.2.13.2 Unit Auxiliary Transformers

STD DEP 8.3-1

The unit auxiliary AC power system supplies power to unit loads that are non-safety-related and uses the main generator and/or offsite power *as the normal power source with the reserve auxiliary transformer*s *as ~~a~~ backup source*s*. The unit auxiliary transformer steps down the AC power to the ~~6900V~~*13.8 kV and 4.16 kV *station bus voltage*s*.*

1.2.2.13.3 Isolated Phase Bus

STD DEP 8.3-1

*The isolated phase bus duct system provides electrical interconnection from the main generator output terminals to the generator breaker and from the generator breaker to the low voltage terminals of the main transformer, and the high voltage terminals of the unit auxiliary transformers. During the time the main generator is off line, the generator breaker is open and power is fed to the unit auxiliary transformers by backfeeding from the main transformer. During startup, the generator breaker is closed ~~at about 7%~~*between 10% and 15% *power to provide power to the main and the unit auxiliary transformers for normal operation of the plant.*

A package cooling unit is supplied with the isolated bus duct system.

1.2.2.13.4 Non-Segregated Phase Bus and Cable

STD DEP 8.3-1

The non-segregated phase bus or cable *provides the electrical interconnection between the unit auxiliary transformers and their associated* ~~*6.9 kV metal clad*~~medium-voltage *switchgear,* and between the reserve auxiliary transformers and their associated medium-voltage switchgear.

1.2.2.13.5 Metal-clad Switchgear

STD DEP 8.3-1

The metal-clad switchgear distributes the ~~*6.9 kV*~~ 13.8 kV or 4.16kV *power. Circuit breakers are drawout type, stored energy vacuum breakers. The switchgear interrupting rating shall be determined in accordance with requirements of* ~~*ANSI*~~IEEE *C37.010.*

1.2.2.13.13 Emergency Diesel Generator System

STD DEP 8.3-1

The Emergency Diesel Generator System is supplied by three diesel generators. Each Class 1E division is supplied by a separate diesel generator. There are no provisions for ~~*transferring*~~ automatic transfer of *Class 1E buses between standby AC power supplies or supplying more than one* division of *engineered safety feature*s *(ESF) from one diesel generator. This one-to-one relationship ensures that a failure of one diesel generator can affect only one ESF division. The diesel generators are housed in the Reactor Building which is a Seismic Category I structure, to comply with applicable NRC and IEEE design guides and criteria.*

1.2.2.13.17 Lighting and Servicing Power Supply

STD DEP 8.3-1

The design basis for the lighting facilities is the standard for the Illuminating Engineering Society. Special attention is given to areas where proper lighting is imperative during normal and emergency operations. The system design precludes the use of mercury vapor fixtures in the containment and fuel handling areas. The normal lighting systems are fed from the ~~*unit auxiliary transformers*~~ non-Class 1E Plant Investment Protection (PIP) buses that are backed up by the combustion turbine generator. *Emergency power is supplied by engineered safety buses backed-up by diesel generators. Normal operation and regular simulated offsite power loss tests verify system integrity.*

1.2.2.14.1 Reserve Auxiliary Transformers

STD DEP 8.3-1

~~*The reserve auxiliary transformer provides the alternate preferred feed for the Class 1E buses M/C, E, F, and G. It also provides an alternate feed to non-Class 1E 6.9 kV buses.*~~

Each reserve auxiliary transformer provides alternate preferred feeds to two power generation buses and can feed any of the three plant investment protection buses and any of the three Class 1E 4.16 kV buses.

1.2.2.15.8 ~~Flammability Control System~~ (Not Used)

STD DEP T1 2.14-1

~~*A recombiner system is provided to control the concentration of hydrogen and oxygen produced by metal water reaction and radiolysis following a design basis accident in the primary containment.*~~

1.2.2.16.5 Heating, Ventilating and Air Conditioning

STD DEP 9.4-4

(9) The Turbine Island HVAC System maintains environmental conditions in the Turbine Building and the Electrical Equipment areas.

STD DEP 9.4-3

(10) The Service Building HVAC System maintains environmental conditions in the Service Building, including clean areas such as the Technical Support Center and Operations Support Center during emergency conditions.

The following site-specific supplement addresses COL License Information Item 9.17.

(11) The Radwaste Building HVAC System is engineered and designed to provide proper environmental conditions within all areas of the Radwaste Building during normal plant operation.

1.2.2.16.5.1 Potable and Sanitary Water System

The information in this subsection of the reference ABWR is incorporated by reference with the following site-specific supplement.

The potable and sanitary water includes ~~conceptual~~ site-specific designs of a potable water system, a sanitary water system, a sewage treatment system, and a separate non-radioactive drain system. These systems are summarized in Subsections 9.2.4.1.3, 9.2.4.3.2, and 9.3.3.2.3, respectively.

1.2.2.16.15 Control Building Annex

STD DEP 1.2-1

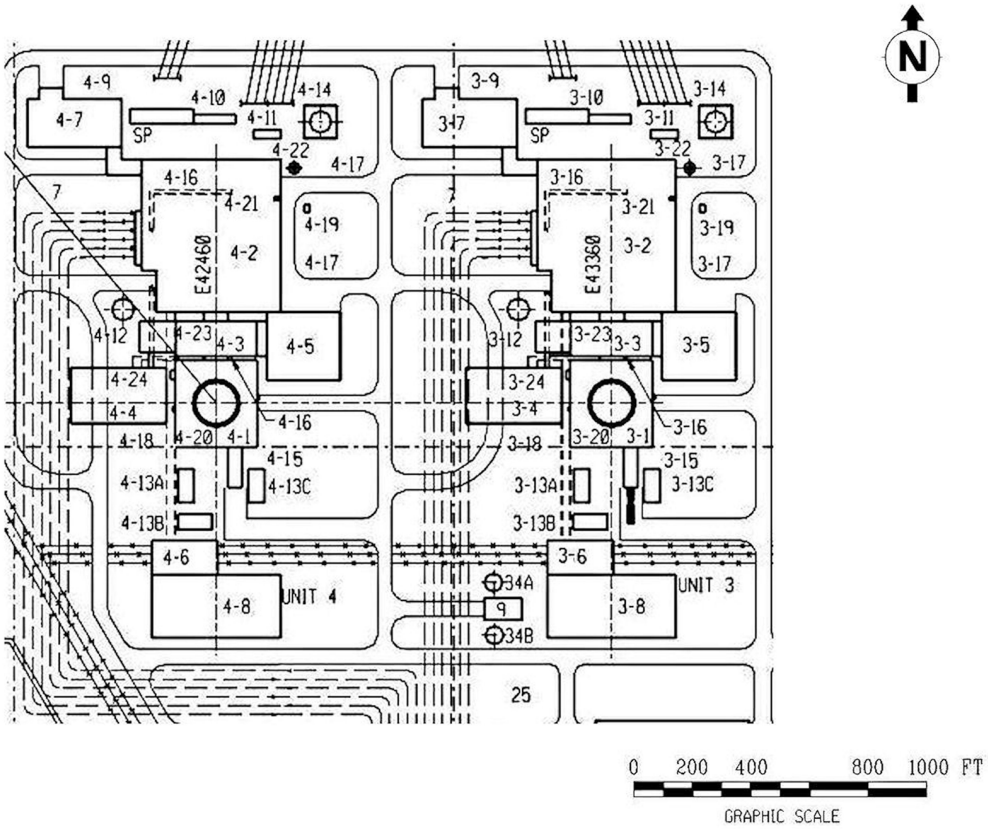
The Control Building Annex is a nonsafety-related structure located adjacent to the Control Building. It houses the two nonsafety-related Reactor Internal Pump Motor

Generator sets, control panels, and the cooling water lines, HVAC system, and electrical lines that support the MG sets. The reactor internal pump motor-generator set equipment performs no safety-related function.

1.2.3 COL License Information

1.2.3.1 Plant Design and Aging Management

The information in this subsection of the reference ABWR DCD is deleted. The information required by COL Information Item 1.1a is provided in Subsection 1.2.1.3.



4-1	UNIT 4 REACTOR BUILDING
4-2	UNIT 4 TURBINE BUILDING
4-3	UNIT 4 CONTROL BUILDING
4-4	UNIT 4 RADWASTE BUILDING
4-5	UNIT 4 SERVICE BUILDING
4-6	UNIT 4 UHS PUMPHOUSE
4-7	UNIT 4 HOT MACHINE SHOP
4-8	UNIT 4 ULTIMATE HEAT SINK
4-9	UNIT 4 MAIN TRANSFORMERS
4-10	UNIT 4 AUXILIARY TRANSFORMERS
4-11	UNIT 4 RESERVE TRANSFORMERS
4-12	UNIT 4 CONDENSATE STORAGE TANK
4-13	UNIT 4 EMERGENCY D/G FUEL OIL TANKS A,B,C
4-14	UNIT 4 COMBUSTION TURBINE FUEL OIL TANKS
4-15	UNIT 4 LARGE EQUIPMENT ACCESS BUILDING
4-16	UNIT 4 RADWASTE TUNNELS
4-17	UNIT 4 NON-NUCLEAR MAINTENANCE LAYDOWN AREA
4-18	UNIT 4 FENCED RADWASTE STORAGE AREA
4-19	UNIT 4 COMBUSTION TURBINE GENERATOR AUXILIARY TRANSFORMER
4-20	UNIT 4 PLANT STACK
4-21	UNIT 4 COMBUSTION TURBINE EXHAUST STACK
4-22	UNIT 4 VENTILIATION STACK
4-23	UNIT 4 CONTROL BUILDING ANNEX
4-24	UNIT 4 WALKWAY FROM RADWASTE BUILDING TO CONTROL BUILDING

3-1	UNIT 3 REACTOR BUILDING
3-2	UNIT 3 TURBINE BUILDING
3-3	UNIT 3 CONTROL BUILDING
3-4	UNIT 3 RADWASTE BUILDING
3-5	UNIT 3 SERVICE BUILDING
3-6	UNIT 3 UHS PUMPHOUSE
3-7	UNIT 3 HOT MACHINE SHOP
3-8	UNIT 3 ULTIMATE HEAT SINK
3-9	UNIT 3 MAIN TRANSFORMERS
3-10	UNIT 3 AUXILIARY TRANSFORMERS
3-11	UNIT 3 RESERVE TRANSFORMERS
3-12	UNIT 3 CONDENSATE STORAGE TANK
3-13	UNIT 3 EMERGENCY D/G FUEL OIL TANKS A,B,C
3-14	UNIT 3 COMBUSTION TURBINE FUEL OIL TANKS
3-15	UNIT 3 LARGE EQUIPMENT ACCESS BUILDING
3-16	UNIT 3 RADWASTE TUNNELS
3-17	UNIT 3 NON-NUCLEAR MAINTENANCE LAYDOWN AREA
3-18	UNIT 3 FENCED RADWASTE STORAGE AREA
3-19	UNIT 3 COMBUSTION TURBINE GENERATOR AUXILIARY TRANSFORMER
3-20	UNIT 3 PLANT STACK
3-21	UNIT 3 COMBUSTION TURBINE EXHAUST STACK
3-22	UNIT 3 VENTILATION STACK
3-23	UNIT 3 CONTROL BUILDING ANNEX
3-24	UNIT 3 WALKWAY FROM RADWASTE BUILDING TO CONTROL BUILDING

Figure 1.2-1 Site Plan

The following figures in Chapter 21 have been revised:

- Figure 1.2-2 Reactor Building, Arrangement Elevation, Section A-A
- Figure 1.2-8 Reactor Building, Arrangement Plan at Elevation 12300 mm
- Figure 1.2-23a Radwaste Building at Elevation 1500 mm
- Figure 1.2-23b Radwaste Building at Elevation 4800 mm
- Figure 1.2-23c Radwaste Building at Elevation 12300 mm
- Figure 1.2-23d Radwaste Building at Elevation 21000 mm
- Figure 1.2-23e Radwaste Building, Section A-A
- Figure 1.2-24 Turbine Building, General Arrangement at Elevation 2300 mm
- Figure 1.2-25 Turbine Building, General Arrangement at Elevation 6300 mm
- Figure 1.2-26 Turbine Building, General Arrangement at Elevation 12300 mm
- Figure 1.2-27 Turbine Building, General Arrangement at Elevation 19700mm
- Figure 1.2-28 Turbine Building, General Arrangement at Elevation 24400mm
- Figure 1.2-29 Turbine Building, General Arrangement at Elevation 27800mm
- Figure 1.2-30 Turbine Building, General Arrangement at Elevation 38300mm
- Figure 1.2-31 Turbine Building, General Arrangement at Elevation 47200mm
- Figure 1.2-32 Turbine Building, General Arrangement at Section A-A
- Figure 1.2-33 Turbine Building, General Arrangement, at Section B-B

The following supplemental figures are added to Chapter 21:

- Figure 1.2-34 UHS Tower Plans
- Figure 1.2-35 UHS Tower Sections
- Figure 1.2-36 RSW Pumphouse, Tunnel Plans and Sections
- Figure 1.2-37 Plot Plan