

7.8 COL License Information

This section of the reference ABWR DCD, including all subsections, is incorporated by reference with the following supplements.

7.8.1 Effects of Station Blackout on the HVAC

The following standard supplement addresses COL License Information Item 7.3.

During the station blackout (SBO) scenario, control room HVAC can be unavailable for up to 10 minutes while the Alternate AC source starts and connects to the safety buses. A control room temperature rise analysis using as-procured and as-built equipment information will be provided prior to fuel load for the station blackout (SBO) scenario. The analysis will demonstrate that the equipment available and used during SBO will not generate sufficient heat to raise environmental temperatures above the qualified limits of the operating equipment. In accordance with 10 CFR 50.71(e), the FSAR will be updated to reflect the results of that analysis. (COM 7.8-1).

7.8.2 Electrostatic Discharge on Exposed Equipment Components

The following site-specific supplement addresses COL License Information Item 7.4.

~~STP 3 & 4 uses modern CMOS (complimentary metal oxide semiconductor) and other MOS components that have internal protection against electrostatic discharge (ESD) in the form of diode clamping arrays and current limiting resistors that conduct the discharge away from the junction. In addition, STP 3 & 4 uses other devices such as transient suppressors (for example, metal oxide varistors, Zener diodes) across critical circuit inputs and outputs that are directly exposed to external transients to protect against ESD. The RPS and ELCS equipment is housed in a metallic enclosure with doors and proper ESD precautions are used prior to servicing the equipment.~~

Other precautions against the effects of ESD take the form of adequate insulation or proper grounding. Keypads generally have insulating material in the form of a thick plastic covering over the metallic switch contacts. Toggle switches and other controls have insulating knobs. Various metallic chassis components (front panel, handles, deck, connector shells) are grounded to each other (the effects of painted and plated surfaces are considered), and the chassis are grounded to the appropriate panel or instrument ground bus by metallic ground straps. ~~Panel and instrument mounting hardware are not depended upon for solid grounds. Printed circuit boards have the signal commons and ground plane commons connected to the common busses and to the low voltage logic power supplies.~~

The equipment is designed to tolerate an electrostatic discharge without damage, partly by employing insulation (with no air gaps) over exposed metallic components, and primarily by providing an alternative path for current flow other than through sensitive circuit paths. As discussed previously, this means that all exposed metallic components of the system are grounded. Low inductance multipoint grounds are used where ESD current flow is desired and single-point grounds where discharge flow is not wanted. Special attention is given to hinges, joints, and seams so that the continuity of shielding is maintained.

In the system configuration, where shielded cables transfer data between the equipment enclosures, the cables are prevented from propagating ESD currents and voltages between system units. For ABWR safety systems, the problem has been reduced by using fiber optic cables as the transmission medium for most critical signals. While the cables may contain metallic supporting members or protective shields, these are not electrically connected to any equipment or circuit. For certain functions where hardwired cable is required, solid grounding of cable shields to the equipment chassis ~~and bypass capacitors~~ at all inputs and outputs ~~are~~ is used to divert ESD currents to ground.

~~These hardware solutions are supplemented with firmware ESD solutions to protect against potential upsets such as system lockup if ESD noise causes memory or data flow errors.~~ The lack of susceptibility of ABWR control equipment to electrostatic discharges shall be verified using the test procedures included in IEC Publication 801-2, Electromagnetic Compatibility for Industrial-Process Measurement and Control Equipment. Part 2: Electrostatic Discharge Requirements. The test procedures of paragraph 8 of this document shall be performed up to and including Severity Level 4, as defined in the document. The following acceptance criteria will be used:

- (1) No change in trip output status shall be observed during the test.
- (2) Equipment shall perform its intended functions after the test.

This result will be verified via ITAAC Table 3.4-1 Item 12.

The safety system control equipment for ABWR has inherent protection against transient ESD effects in that ~~data is continually refreshed throughout the system, including trip, display and indicator status~~ it is housed in a metallic enclosure with doors and that proper ESD precautions are used prior to servicing the equipment. Further protection is provided by the asynchronous, four-division, 2-out-of-4 channel configuration. Temporarily corrupted data in one division cannot cause an inadvertent trip or permanently disable a required trip. When bad data or equipment damage is detected, the affected division can be bypassed until repaired. In the reactor trip and isolation system (RTIS) channels, where the final trip outputs are also in a 2-out-of-4 configuration, both the sensor input and trip output sides of each equipment division can be bypassed, thus preventing failure from any cause in one channel from inhibiting or inadvertently causing a trip.

7.8.3 Localized High Heat Spots in Semiconductor Materials for Computing Devices

The following standard supplement addresses COL License Information Item 7.5 and incorporates design-related information originally provided in Chapter 20 of the DCD.

Equipment purchase specifications for the Safety System Logic and Control (SSLC) systems will include the following provisions:

- Supplier shall follow ~~component~~ vendor recommendations for the design and use of heat sinking and ventilation of local areas where power semiconductors of solid-state load drivers are used.
- Supplier shall design solid-state load drivers such that high power devices will be physically separated from low power circuitry in accordance with ~~component~~ vendor recommendations.
- ~~Supplier shall perform thermal analyses of the as-built circuit boards, instruments, and panels. These analyses shall assume convective cooling only and shall take no credit for forced air cooling provided by fans. An ambient external room temperature of 50°C shall be assumed. These analyses shall demonstrate that heat release by internal panel components will not raise the internal temperature of a panel to greater than 15°C above external ambient temperature of the equipment room for electronic components within a chassis or within any printed-circuit file structure.~~
- ~~Supplier shall environmentally qualify safety related equipment for the most extreme conditions determined by the above stated thermal analyses, including minimum margins as stated in IEEE 323, Subsection 6.3.1.5.~~
- Supplier shall design the SSLC computing devices for the external cabinet environment according to the environmental tables in Appendix 3I.
- Supplier shall perform environmental qualification of SSLC equipment, including temperature and humidity in accordance with IEEE 323.
- Supplier shall be permitted to provide the RPS equipment that utilizes convective cooling (no fans) only.
- Supplier shall be permitted to provide the ELCS equipment that utilizes internal forced air cooling. A local temperature sensor and diagnostic alarm shall be provided for each cabinet.
- The temperature rise internal to the cabinet shall be verified during environmental qualification and during factory acceptance testing for each cabinet.

The above provisions will be completed at the time that purchase orders are placed for the SSLC systems. In accordance with 10 CFR 50.71(e), the FSAR will be updated to reflect the results of the ~~analysis~~environmental qualification. (COM 7.8-2)

