15B Failure Modes and Effects Analysis (FMEA)

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

STD DEP T1 3.4-1 (Table 15B-3)

STD DEP 7.7-1 (Figure 15B-1)

15B.1 Introduction

STD DEP T1 3.4-1l

This appendix provides failure modes and effects analyses (FMEAs) for two ABWR systems and one major component which represent a significant change from past BWR designs. Specifically, FMEAs are provided for the following:

(2) ~~Essential Multiplexing system~~ Data Communication Function (DCF) of the Reactor Trip and Isolation System (RTIS) and ESF Logic and Control System (ELCS)

15B.2.3 Description

STD DEP 7.7-1

A simplified CRD System process flow diagram is shown in Figure 15B-1. CRD System water is taken from the condensate, feedwater and condensate air extraction system, or Condensate Storage Tank (CST) through a suction filter by a centrifugal pump and discharged through a drive water filter to the HCUs. (During shutdown the CST is the primary source.) Each of these components is independently redundant and only one of each is in operation at any one time. A portion of the pump discharge flow is diverted through a minimum flow bypass line to the CST. The pumped water is directed to the HCU to provide hydraulic scram and to furnish purging to the drive. This system also provides purge water for the reactor internal pumps, nuclear boiler instrument lines, *and the reactor water cleanup pumps.*

15B.4 ~~Essential Multiplexing System~~ Data Communication Function of the RTIS and the ELCS

STD DEP T1 3.4-1

The FMEA is described by the PRA fault tree analyses in Chapter 19 (see Subsections 19D.6.4.3 and Section 19Q.5) and the analysis of common-cause failure of ~~multiplexer~~ data communication *equipment in Appendix 19N. The system configuration fault definitions and provisions for fault tolerance are discussed and analyzed in the PRA.*

Table 15B-3 DCF of the RTIS and the ELCS ~~***EMS Failure Mode and Effects Analysis***~~

Component Identification	Function	Failure Mode	Failure Mechanism	Effect on System	Method of Failure Detection	Remarks
Remote ~~*mux unit (RMU)*~~ **Digital Logic Controller (RDLC)**	Condition, format and transmit sensor and control signals	Loss of signal or false signal	Loss of electrical power, solid state device failure, loose connection, broken wire	Loss of sensor/ control signal or false signal rejected	Self-test feature and device annunciation in control room	Immediate detection of loss of signal, system test for false signal
~~*Control room mux unit (CMU)*~~ **Digital Logic Controller (DLC)**	Condition, format and transmit sensor and control signals	Loss of signal or false signal	Loss of electrical power, solid state device failure, loose connection, broken wire	Loss of sensor/ control signal or false signal rejected	Self-test feature and device annunciation in control room	Immediate detection of loss of signal, system test for false signal
~~*Multiplexer control units (MCU)*~~	~~*Convert digital to optical signals and vice versa*~~	~~*Loss of signal or false signal*~~	~~*Loss of electrical power, solid state device failure, loose connection, broken wire*~~	~~*Loss of sensor/control signal or false signal rejected*~~	~~*Self test feature and device annunciation in control room*~~	~~*Immediate detection of loss of signal, system test for false signal*~~

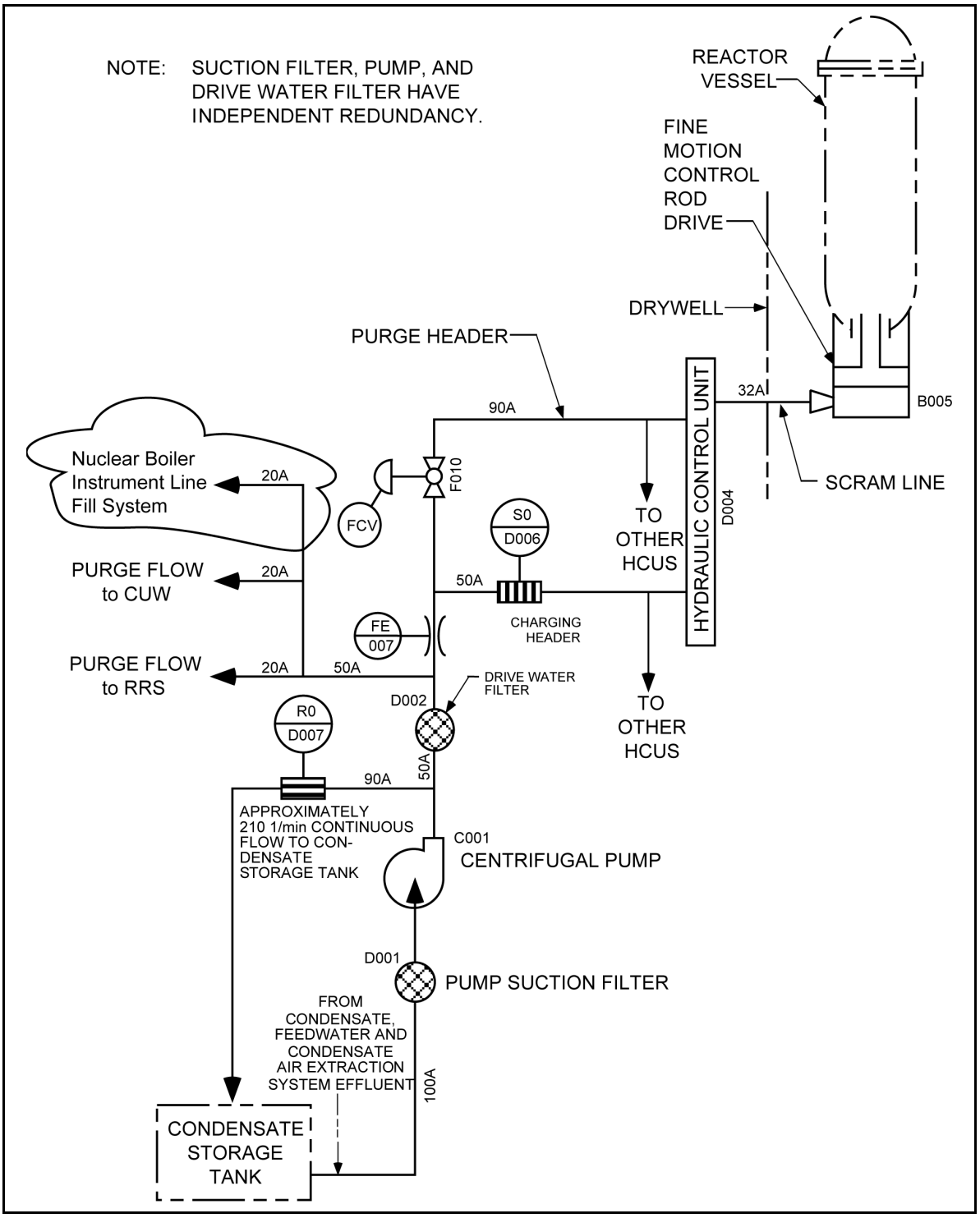

Figure 15B-1 Simplified CRD System Process Flow Diagram