

UK ABWR

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UK ABWR Generic Design Assessment

Generic PCSR Sub-chapter 20.5 : Protection and Provisions against Radioactive Contamination



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Table of Contents

20.5.1 **Scope.....20.5-1**

20.5.2 **Protection and Provisions against Radioactive
Contamination.....20.5-2**

20.5.2.1 **Minimising Production of Contamination.....20.5-2**

20.5.2.2 **Minimising Spread of Contamination.....20.5-2**

20.5.1 Scope

The primary objective of provisions against radioactive contamination is to protect workers from the internal dose caused by leakage from the components such as piping and equipment containing radioactive materials and by spread of contamination.

The scope of this Sub-chapter is to summarise the countermeasures to minimise production of contamination and to restrict spread of contamination during Operation Condition I in reactor, turbine, radioactive waste buildings and other building containing radioactive sources.

Provisions against contamination during design basis accidents will be described in PCSR Sub-chapter 20.8. In addition, countermeasures to minimise contamination during SFIS and decommissioning will be discussed in PCSR Chapter 32 and 31, respectively. These will be provided in Step 3 to 4.

20.5.2 Protection and Provisions against Radioactive Contamination

20.5.2.1 Minimising Production of Contamination

To minimise production of contamination, control of reactor water chemistry and material selection is determined appropriately. They will be discussed in PCSR Chapter 23 Reactor Chemistry and a Topic Report associated with RO-ABWR-0006 Source Terms in Step 3.

20.5.2.2 Minimising Spread of Contamination

20.5.2.2.1 Equipment Design

Equipment containing radioactive materials is designed to limit leakage of contamination from equipment. Flushing and drain provisions to decontaminate are also considered. These are provided in PCSR Sub-chapter 20.3.3.2 and 20.3.6.1 Equipment Design.

20.5.2.2.2 Layout Design

Facility layout associated with radioactive materials such as floor drains is designed to minimise spread of contamination. This is discussed in PCSR Sub-chapter 20.3.4.3 and 20.3.6.3 Layout Design.

20.5.2.2.3 Ventilation

Heating Ventilating and Air Conditioning System (HVAC) for the various buildings in the Nuclear Power Plant (NPP) is discussed in Generic PCSR Chapter 16, including the design bases, system descriptions, and evaluations with regard to the heating, cooling, and ventilating capabilities of the systems as well as the radiation control aspects of HVAC.

(1) Design Objective

The HVAC is designed to keep airborne radiation exposures to plant personnel and releases to the environment ALARP. One of the HVAC function is to keep negative pressure within the area so the contaminants are not spread and to provide the function of dilution of contaminants when they are generated by ensuring sufficient ventilation rate. In addition, the exhaust air from contaminated areas is treated with the filter and discharged to the stack. For more detail, refer to Generic PCSR Chapter 16.

(2) Design Description

Air flow direction within the building is directed from less contaminated area to more contaminated area and the contamination is prevented from spreading to other areas. As for the HVAC located within the radiation controlled area, differential pressure of the inside/outside of the building is adjustable so the pressure of the whole areas are ensured to negative.

Radiation level of the air stream is monitored at the final outlet duct in the R/B Controlled area and the HVAC is automatically isolated upon detecting high level. Normal radiation level is monitored at the main stack and manually surveyed in the building atmosphere to ensure ALARP. Detail of monitoring system will be described in Chapter 14 Control and Instrumentation in Step 3.

20.5.2.2.4 Contamination Monitoring

Contamination monitoring is also an essential approach to minimise occupational dose. The monitoring equipment to detect surface and airborne contamination is discussed in PCSR Subchapter 20.6.