Form10/00

HITACHI

**UK ABWR**

| | | |
|---|---|---|
| Document ID | : | GA91-9101-0101-20001 |
| Document Number | : | HE-GD-5051 |
| Revision Number | : | A |

# UK ABWR Generic Design Assessment

## Generic PCSR Sub-chapter 20.1 : Introduction


**Hitachi-GE Nuclear Energy, Ltd.**

## DISCLAIMERS

### *Proprietary Information*

This document contains proprietary information of Hitachi-GE Nuclear Energy, Ltd. (Hitachi-GE), its suppliers and subcontractors. This document and the information it contains shall not, in whole or in part, be used for any purpose other than for the Generic Design Assessment (GDA) of Hitachi-GE's UK ABWR. This notice shall be included on any complete or partial reproduction of this document or the information it contains.

### *Copyright*

**Table of Contents**

# 20.1.1 General Description

The aim of this section is to describe the summary of each section and also to define the criteria relating to radiation protection on which the design of the UK ABWR is based.

## 20.1.1.1 Radiation Protection Requirements

Sub-chapter 20.1 (this document), Radiation Protection Requirements, outlines the relevant regulatory requirements in terms of international recommendations, the European Directive which takes account of those international recommendations. This legislation is as follows.

- The Ionising Radiations Regulations 1999 (IRR99) [Ref-1].

The detailed information is provided in Section 20.1.2 Standards and Criteria related to Radiation Protection in this section.

## 20.1.1.2 Definition of Radioactive Sources

Sub-chapter 20.2, Definition of Radioactive Sources, explains radioactive sources for shielding design such as fission products based on noble gas release rate and activation products including corrosion products.

## 20.1.1.3 Strategy to Ensure that the Exposure is ALARP

Sub-chapter 20.3, Strategy to Ensure that the Exposure is ALARP, outlines the principles of radiation protection, design considerations and methods to maintain radiation exposure ALARP which have two objectives:

- Minimising the necessity for and the amount of time spent in radiation areas for personnel.
- Minimising radiation levels in routinely occupied plant areas and in the vicinity of plant equipment expected to require personnel attention.

## 20.1.1.4 Protection and Provisions against Direct Radiation

Sub-chapter 20.4, Protection and Provisions against Direct Radiation, outlines the method of shielding design related to calculations such as computer codes and shielding materials, which is evaluated considering radioactive sources described in sub-chapter 20.2 Definition of Radioactive Sources.

## 20.1.1.5 Protection and Provisions against Radioactive Contamination

Sub-chapter 20.5, Protection and Provisions against Radioactive Contamination, summarises the countermeasures to minimise contamination such as minimising production and spread of contamination. This includes equipment design, layout design, ventilation and monitoring associated with contamination.

### 20.1.1.6 Radiation and Contamination Monitoring of Occupational Exposure

Sub-chapter 20.6, Radiation and Contamination Monitoring of Occupational Exposure, outlines the radiation monitoring system to minimise occupational radiation dose to ALARP and to ensure that operational dose is within the dose-limits.

### 20.1.1.7 Dose Assessment for Public from Direct Radiation

Sub-chapter 20.7, Dose Assessment for Public from Direct Radiation, describes the principles and assessment of the off-site radiation doses for the public from direct radiation.

### 20.1.1.8 Post Accident Accessibility

Sub-chapter 20.8, Post Accident Accessibility, defines the systems, rooms and components where access would be required in post-accident conditions.

## 20.1.2 Standards and Criteria related to Radiation Protection

The management of radiation protection in the UK is governed by legislation (including regulations), principles and criteria. The legislative requirements are listed in the table below:

**Table 20.1-1: Legislative Requirements**

| Recommendations / Legislation | | Effective dose limits | |
|---|---|---|---|
| International Recommendations | ICRP 2007 (Publication 103) [Ref-2] | Workers | 100mSv over 5years<br>Max 50mSv in any given year |
| | | Public | 1mSv/y |
| European Recommendations | Council Directive 2013/59/Euratom [Ref-3] | Workers | 100mSv over 5years<br>Max 50mSv in any given year |
| | | Public | 1mSv/y |
| UK Legislation | The Ionising Radiations Regulations 1999 (IRR99) [Ref-1] | Workers | 20mSv/y (individual)<br>500mSv/y (extremities and skin)<br>150mSv/y (lens of eye) |
| | | Public | 1mSv/y (from all sources on a site)<br>50mSv/y (extremities and skin)<br>15mSv/y (lens of eye) |

The International Commission on Radiological Protection (ICRP) draws its recommendations from the work of various scientific authorities who study the effects of ionising radiation on man.

The Member States of the European Union are bound by the EURATOM Treaty, from which international recommendations are transferred into Directives published in the Official Journal of the European Union.

The UK IRRs aim at ensuring that exposure to ionising radiations from work activities are kept As Low As Reasonably Practicable (ALARP) and do not exceed the specified dose limits. The IRRs stipulate that a radiation employer should take all necessary measures to restrict so far as is reasonably practicable (SFAIRP) the extent to which its employees and other persons are exposed to ionising radiations.

They also specify lower legal limits for the annual exposure of workers and public, that are, respectively, 20 mSv/year and 1 mSv/year (from all sources). Additional limits are also specified for exposure to the eye lens, for equivalent doses to the skin, the hands, forearms, feet and ankles.

The framework underpinning all of the standards and criteria above are the ICRP principles of radiation protection, namely, justification, optimisation and limitation.

- Exposures to ionising radiation should be optimised. Radiation exposures must be restricted “so far as is reasonably practicable” (SFAIRP) under IRR99, that is, doses should be “as low as reasonably practicable” (ALARP).

- Exposures to ionising radiation should be limited in that they must not exceed the statutory dose limits in IRR99.

In the context of new nuclear power plants, this duty generally requires that all measures are taken by the employer (and so by the designers and operators) to minimise radiation doses to workers and members of the public providing it is not grossly disproportionate compared with the benefits achieved. In addition, where legislation gives prescriptive requirements these must also be met.

## 20.1.3 References

[Ref-1] The Ionising Radiations Regulations 1999, Statutory Instrument 1999 No.3232, HM Stationary Office

[Ref-2] The 2007 Recommendations of the International Commission on Radiological Protection. ICRP Publication 103. Ann ICRP, 37, 2-4. ICRP (2007)

[Ref-3] The Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom