




UK EPR	Title: PCER – Sub-chapter 6.0 – Safety requirements	
	UKEPR-0003-060 Issue 03	
Total number of pages: 9		Page No.: I / II
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Name/Initials  Date 21-05-12		
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Name/Initials  Date 21-05-2012		Name/Initials  Date 21-05-2012

REVISION HISTORY

Issue	Description	Date
00	First issue.	28.04.08
01	PCSR June 2009 update: - Inclusion of references Update equivalent PCER chapter	19.09.09
02	PCER MARCH 2011 update - Minor editorial changes - Update of references	29.03.11
03	PCER Submission 2012 - References listed under each numbered section or sub-section heading numbered [Ref-1], [Ref-2], [Ref-3], etc - Minor editorial and typographical changes for consistency	21.05.12

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SUB-CHAPTER 6.0 - SAFETY REQUIREMENTS

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1. SAFETY FUNCTIONS

Radioactive waste management systems provide containment, measurement and control of solid, liquid and gaseous radioactive discharges to the environment, during normal operation and fault conditions.

The Gaseous Waste Processing System (TEG [GWPS]) and the Nuclear Vent and Drain System (RPE [NVDS]) form part of the third containment barrier. They ensure containment isolation at the containment penetrations (for the TEG [GWPS], the sections concerned are those connected to the pressuriser and the Reactor Building primary effluent tank).

In addition, the Gaseous Waste Processing System limits the hydrogen concentration in systems connected to the TEG [GWPS] in order to prevent the formation of explosive mixtures. It also treats gaseous waste in order to minimise operator exposure to radiation, and ensures that activity released to the environment complies with the authorised discharge limits and is as low as reasonably achievable (ALARA).

2. FUNCTIONAL REQUIREMENTS

The RPE [NVDS] collects all the liquid waste produced both inside and outside the containment and part of the gaseous waste in the Reactor Building, and transports it to the associated storage and treatment facilities prior to monitoring and discharge. In this respect, the RPE [NVDS] contributes to compliance with the authorised discharge limits for liquid and gaseous waste.

The Coolant Storage and Treatment System (TEP [CSTS]) enables the measurement, storage, and treatment of primary liquid waste recycled in the primary cooling system so as to limit, as far as possible, the discharge of radioactive waste. During the transient phase when shutting down the reactor, part of the TEP [CSTS] system cleans up the primary cooling system to limit to the lowest possible level the dose incurred by personnel working during shutdown and to meet the dose limits set during the various stages of the cold shutdown. It also enables treatment of waste oxygenated when opening or draining the primary cooling system. It does not however fulfil an active safety function; there are no safety-related functional requirements.

The TEG [GWPS] system enables containment, treatment and decay of primary gaseous effluent derived from treatment of the primary coolant or present in the cover gas of tanks containing primary coolant.

It contributes to the functions of radioactive containment, limitation of discharge in normal operation, and containment isolation.

The liquid effluent collection system is designed to enable the controlled re-injection, from the control room, into the Reactor Building of highly-contaminated liquid effluent present in the Nuclear Auxiliary Building or in the Fuel Building in a post-accident situation.

The effluent monitoring and discharge systems enable compliance with the site-specific authorised discharge limits for liquid and gaseous effluent.

The solid waste systems allow for the segregation, storage, treatment and packaging and interim storage of solid ILW and LLW waste (not including fuel) pending off-site disposal routes in accordance with the relevant regulatory requirements.

It is a functional requirement that the systems allow discharges to comply with the relevant authorisations, based on discharges being as low as reasonably practical and in accordance with the relevant public dose limits (see Sub-chapter 6.4).

3. DESIGN REQUIREMENTS

3.1. REQUIREMENTS ARISING FROM SAFETY CLASSIFICATION

Safety classification

The effluent and waste treatment systems are safety-classified in accordance with the classification given in Sub-chapter 3.2 of the PCSR.

Active and passive single failure criterion

The single failure criterion applies to the active components of that part of the effluent and waste treatment systems that fulfil an F1A function, in particular the containment isolation valves of the sections of the TEG [GPWS] system that are connected to the pressuriser and the Reactor Building primary effluent tank, as well as the containment shut-off valves of the RPE [NVDS] system.

Emergency electrical supplies

All the F1A electrical components of effluent and waste treatment systems are supplied by emergency electrical switchboards. The F2 parts of the TEG [GPWS] system are connected to the emergency electrical supplies to ensure uninterrupted waste treatment, not to meet any safety requirement.

The F2 functions of effluent and waste treatment systems are related to monitoring and controlling radioactivity during normal operation (such as discharge routes, specific activity monitoring and waste retention).

Qualification for operating conditions

The effluent and waste treatment systems equipment is qualified in accordance with its safety role, for the conditions experienced during fulfilment of its function.

Mechanical, electrical, instrument and control and seismic classifications

The effluent and waste treatment systems equipment is classified in accordance with the requirements given in Sub-chapter 3.2 of the PCSR.

Periodic tests

The effluent and waste treatment systems are designed to enable periodic testing of the safety functions of the following systems: RPE [NVDS], TEG [GWPS] (manoeuvrability of the containment shut-off valves) and TEP [CSTS].

3.2. OTHER REGULATORY REQUIREMENTS

This sub-section focuses on the basic requirements of environmental legislation which can impact on the design of the EPR.

General Waste

- Environmental Protection Act 1990 (EPA '90) [Ref-1]
- Water Resources Act 1991 [Ref-2]
- The Pollution Prevention and Control (PPC) Act 1999 (as amended) [Ref-3]
- The PPC Act and Best Available Techniques (BAT) are described in greater detail in Chapter 8 of the PCER.

Radioactive Waste

Principal Legislation

- Radioactive Substances Act 1993 (as amended by the Environment Act 1995) [Ref-4]
- Nuclear Installations Act 1965 (as amended 1969) (for Nuclear Licensed sites) [Ref-5]
- Environmental Protection Act 1990 (Parts II and IIA) (as amended) [Ref-6]
- Environment Act 1995 (Chapter 25) [Ref-7]
- Radioactive Material (Road Transport) Act 1991 [Ref-8]
- Radioactive Substances (Basic Safety Standards) (England and Wales) Direction 2000 [Ref-9]

Regulations

- The Ionising Radiations Regulations 1999 [Ref-10]
- The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2007 [Ref-11]
- Article 37 of the Euratom treaty [Ref-12].

Legal requirements

- HSE Guidance: Management of Radioactive materials and Waste Nuclear Licensed Sites 2001 [Ref-13]
- European directive 97/23/CE governing pressurised equipment [Ref-14].

Basic Safety Rules

Not applicable.

Specific EPR requirements (system requirements: handling, ventilation, etc.)

Not applicable.

3.3 HAZARDS

The effluent and waste treatment systems are protected against internal and external hazards in accordance with the requirements of Chapter 13 of the PCSR.

SUB-CHAPTER 6.0 – REFERENCES

External references are identified within this sub-chapter by the text [Ref-1], [Ref-2], etc at the appropriate point within the sub-chapter. These references are listed here under the heading of the section or sub-section in which they are quoted.

3. DESIGN REQUIREMENTS

3.2. OTHER REGULATORY REQUIREMENTS

- [Ref-1] Environmental Protection Act 1990. HM Stationery Office. November 1990, reprinted January 2004. ISBN 0105443905. (E)
- [Ref-2] Water Resources Act 1991. ISBN 978-010545791-6. The Stationery Office Ltd. (E)
- [Ref-3] The Pollution Prevention and Control Act 1999 (as amended). HM Stationery Office. August 1999. ISBN 0105424994. (E)
- [Ref-4] The Radioactive Substances Act 1993. HM Stationery Office. ISBN 0-10: 0105412937. (E)
- [Ref-5] The Nuclear Installations Act 1965 (as amended). HM Stationery Office. ISBN 0108502163. (E)
- [Ref-6] Environmental Protection Act 1990. HM Stationery Office. November 1990, reprinted January 2004. ISBN 0105443905. (E)
- [Ref-7] Environment Act 1995. ISBN 978-010542595-3. The Stationery Office Ltd. (E)
- [Ref-8] Radioactive Material (Road Transport) Act 1991. HM Stationery Office. July 1991. ISBN 0105427918. (E)
- [Ref-9] Radioactive Substances (Basic Safety Standards) (England and Wales) Direction 2000. DEFRA. (E)
- [Ref-10] The Ionising Radiations Regulations 1999. Statutory Instrument 1999 No. 3232. HM Stationery Office. ISBN 0-11-085614-7. (E)
- [Ref-11] The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2007. HM Stationery Office. July 2007. ISBN 0110774698. (E)
- [Ref-12] Treaty establishing the European Atomic Energy Community (1957). EUR-Lex. See also COMMISSION RECOMMENDATION of 6 December 1999 on the application of Article 37 of the Euratom Treaty (1999/829/Euratom). (E)
- [Ref-13] UK Health and Safety Executive (HSE). Technical Assessment Guide, Management of Radioactive Materials and Radioactive Waste on Nuclear Licensed Sites. T/AST/024 Issue 003. March 2001. (E)

[Ref-14] Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment. (E)