UK EPR	Title: PCSR – Sub-chapter 17.1 – Explanation of ALARP Requirement
	UKEPR-0002-171 Issue 04

Total number of pages: 7	Page No.: I / III
Chapter Pilot: G. BODY *Name/Initials* *Date* *10-05-2012*	
Approved for EDF by: A. PETIT *Name/Initials* *Date* *24-05-2012*	Approved for AREVA by: G. CRAIG *Name/Initials* *Date* *24-05-2012*

REVISION HISTORY

Issue	Description	Date
00	First issue for INSA review	22/4/2008
01	Integration of technical and INSA review comments	28/6/2008
02	PCSR June 2009 update: - Inclusion of references	27/06/2009
03	Consolidated Step 4 PCSR update: - minor editorial changes	28/03/2011
04	Consolidated PCSR update: - References listed under each numbered section or sub-section heading numbered [Ref-1], [Ref-2], [Ref-3], etc - Minor editorial changes	24/05/2012

For information address:

AREVA NP SAS
Tour AREVA
92084 Paris La Défense Cedex
France

EDF
Division Ingénierie Nucléaire
Centre National d'Equipement Nucléaire
165-173, avenue Pierre Brossolette
BP900
92542 Montrouge
France

TABLE OF CONTENTS

SUB-CHAPTER 17.1 - EXPLANATION OF ALARP REQUIREMENT

1. INTRODUCTION

UK Health and Safety Legislation [Ref-1] places a duty on all companies to conduct their operations such that the risk posed to their workers and members of the public is as low as reasonably practicable (ALARP). In the context of a nuclear power plant, this duty requires that all measures are taken during design and operation to minimise radiation doses to workers or members of the public, provided the cost of such measures is not disproportionately large compared with the benefits achieved. The UK Health and Safety Executive (HSE) [Ref-2] has proposed thresholds of risk due to radiation exposure from operation of nuclear power stations in the UK as follows:

- a lower threshold of risk (the 'Broadly Acceptable' risk level), below which the HSE would not normally request further significant plant modifications to reduce risk (however the legal duty on the duty-holder to reduce risk if it is reasonably practicable to do so, remains). This risk level corresponds to a risk of individual fatality due to radiation exposure of 10^{-6}/yr.

- an Upper Tolerable level of risk above which plant operation would not normally be acceptable. This risk level corresponds to a risk of individual fatality due to radiation exposure of 10^{-4}/yr.

- an intermediate region of risk, (referred to as the 'Tolerable if ALARP region') in which plant operation could only be justified if the level of risk was clearly outweighed by the societal benefits of operating the plant, such that no further measures to reduce risk were reasonably practicable. This region is referred to as the 'Tolerable if ALARP region'.

These risk thresholds are shown in Sub-chapter 17.1 - Figure 1.

HSE has presented guidance for the application of the ALARP principle for the new civil nuclear reactor designs presented for Generic Design Assessment [Ref-3]. The safety benefits of presenting a standardised design are recognised in the HSE guidance. It is suggested that to establish that a new reactor design meets the ALARP principle, supporting safety submissions should include the following information:

- A demonstration of **Relevant Good Practice**. This is a basic requirement to demonstrate that designs meet the law. The Requesting Party must set out the standards and codes used in the design and justify them to allow HSE to confirm that the HSE Safety Assessment Principles (SAPs) have been achieved. The justification is expected to include a comparison with applicable international/national standards.

- A review of **Design Options** considered in design process. This should present the rationale for the evolution of the design, and the improvements from predecessor designs, explaining why certain features were selected and others rejected.

- Presentation of results of a **Probabilistic Safety Assessment** to show if possible that the HSE 'Broadly Acceptable' risk targets are met by the design, in support of the overall ALARP demonstration.

- Arguments that **no further reasonably practicable improvements** could be implemented, and therefore the risk has been reduced to ALARP. These could be based on postulating further options for improvement and evaluating them, or by showing that only trivial further expenditure was warranted to reduce the risk.

This chapter of the PCSR provides information in each of the above identified areas to show that the UK EPR design meets the UK ALARP requirement. The chapter is organised as follows:

- Sub-chapter 17.2 provides the required demonstration of Relevant Good Practice and discusses comparison of the EPR design against the HSE SAPs.

- Sub-chapter 17.3 reviews the design options considered in the EPR design optimisation process and explains the rationale for the options chosen in terms of the fundamental requirement to minimise risks to workers and the public from EPR operation.

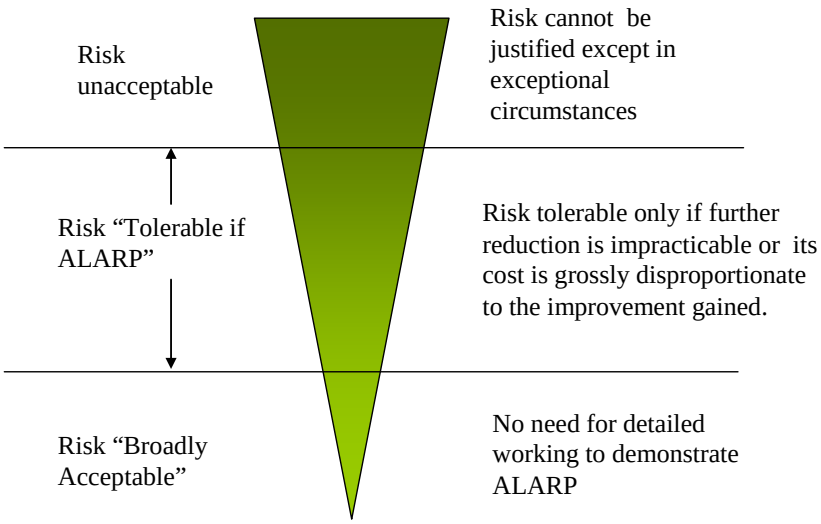
- Sub-chapter 17.4 summarises the results of the Level 3 PSA, which demonstrates that the risk to the public due to accidents meets the HSE targets for 'Broadly Acceptable' risk.

- Sub-chapter 17.5 considers additional modification options requested by US and Finnish regulators, modifications implemented in the Sizewell B PWR, and other potential improvements identified during the UK EPR GDA. It assesses if these are warranted for the design of the UK EPR, under the UK principles of ALARP.

- Sub-chapter 17.6 summarises the conclusions of the ALARP review.

SUB-CHAPTER 17.1 - FIGURE 1

Levels of Risk and ALARP [Ref-1]



SUB-CHAPTER 17.1 – 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.

1. INTRODUCTION

[Ref-1] Health and Safety at Work Act, 1974. ISBN 978-010215683-6. The Stationery Office Ltd, October 1974. (E)

[Ref-2] UK Health and Safety Executive (HSE). The Tolerability of Risk from Nuclear Power Stations. ISBN 0118863681. The Stationery Office Ltd. 1992. (E)

[Ref-3] UK Health and Safety Executive (HSE). Technical Assessment Guide, ND Guidance on the Demonstration of ALARP (As Low As is Reasonably Practicable). T/AST/005 Issue 4 Revision 1. January 2009. (E)

SUB-CHAPTER 17.1 - FIGURE 1

[Ref-1] UK Health and Safety Executive (HSE). The Tolerability of Risk from Nuclear Power Stations. ISBN 0118863681. The Stationery Office Ltd. 1992. (E)