

CONTENTS

1.	INTRODUCTION	1
1.1.	Definition of terminology	3
1.2.	Necessity of plant life management	4
1.3.	Goals of plant life management	6
1.4.	Scope of the publication	6
1.5.	Objectives of the publication	6
1.6.	Structure	7
2.	CURRENT TRENDS.....	8
2.1.	Preconditions for plant life management.....	8
2.1.1.	Preconditions for the implementation of plant life management for long term operation	9
2.2.	Approaches to plant life management.....	10
2.2.1.	Licence renewal applications for nuclear power plants operating in the USA.....	11
2.2.2.	Periodic safety review applications in Japan and France.....	14
2.2.3.	Periodic safety review and licence renewal application using Spain and Hungary as examples	21
3.	GENERAL APPROACH TO PLANT LIFE MANAGEMENT ..	25
3.1.	Phase 1: Feasibility study of plant life management.....	25
3.1.1.	Review of the preconditions for plant life management and data collection	26
3.1.2.	Evaluations of key life determining components of nuclear power plants	26
3.1.3.	Review of regulatory requirements	27
3.1.4.	Preliminary economic analysis	27
3.2.	Phase 2: Detailed plant life evaluation and establishment of a plant life management programme.....	28
3.2.1.	Steps for the establishment of plant life management..	28
3.2.2.	Establishment of the plant life management programme	29
3.3.	Phase 3: Implementation of plant life management.....	37
3.3.1.	Guidelines and procedures	37
3.3.2.	Implementation schedule	38

3.3.3.	Organization and management	39
3.3.4.	Quality assurance activities.....	39
4.	ISSUES CONCERNING PLANT LIFE MANAGEMENT.....	40
4.1.	Technological issues	40
4.1.1.	Methods for monitoring systems, structures and components.....	40
4.1.2.	Degradation detection and damage evaluation of some selected components	42
4.1.3.	Obsolescence of equipment	61
4.2.	Regulatory issues	62
4.2.1.	Regulatory aspects of plant life management and regulatory control of long term operation	62
4.2.2.	Communication between operating organizations and regulatory bodies	63
4.2.3.	Public acceptance.....	64
4.2.4.	Environmental radiological impacts of plant life management for long term operation	65
4.2.5.	Code and standards	66
4.3.	Economic issues	67
4.3.1.	Economic planning	67
4.3.2.	Cost-benefit analysis	72
4.4.	Personnel issues associated with plant life management for long term operation	73
4.4.1.	Qualification and availability of nuclear power plant personnel.....	73
4.4.2.	Personnel exposure associated with plant life management for long term operation	75
4.4.3.	Roles and responsibilities of operating organizations and regulatory bodies	75
4.5.	Plant life management and power uprating	79
4.6.	Additional aspects of plant life management	82
4.6.1.	Organization	83
4.6.2.	Documentation.....	83
4.6.3.	Maintaining the personnel level and technical competence	84
4.6.4.	Evolution of the industrial structure	86
4.6.5.	Information systems.....	86

5.	RELATIONSHIP BETWEEN PLANT MAINTENANCE AND PLANT LIFE MANAGEMENT	87
5.1.	Relationship between backfit and replacement of systems, structures and components and safe operation.	87
5.2.	Relationship between the maintenance programme and ageing management	87
5.3.	Maintenance rule	89
5.4.	Relationship between maintenance and plant life management	90
6.	RESEARCH AND DEVELOPMENT REQUIREMENTS FOR PLANT LIFE MANAGEMENT FOR LONG TERM OPERATION.	92
6.1.	Role of research and development.	92
6.2.	Construction and use of databases	93
6.3.	European Commission programme on plant life management	94
6.4.	IAEA programmes on plant life management	95
6.4.1.	Ageing management activities of the IAEA	95
6.4.2.	Reactor pressure vessel integrity	96
6.4.3.	Database for plant life management	97
6.4.4.	Maintenance programmes and in-service inspection	97
7.	CONCLUSIONS AND RECOMMENDATIONS.	98
7.1.	Conclusions	98
7.2.	Recommendations	100
	APPENDIX I: EXAMPLES FROM MEMBER STATES OF GOOD PRACTICES IN NUCLEAR POWER PLANT LIFE MANAGEMENT	103
	APPENDIX II: EUROPEAN COMMISSION PROGRAMMES SUPPORTING NUCLEAR POWER PLANT LIFE MANAGEMENT	110
	REFERENCES	119
	CONTRIBUTORS TO DRAFTING AND REVIEW	123