

CONTENTS

PREAMBLE	1
1. INTRODUCTION	3
1.1. STRUCTURE OF THE REPORT	5
2. OBJECTIVES	6
2.1. GENERAL NUCLEAR SAFETY OBJECTIVE	6
2.2. RADIATION PROTECTION OBJECTIVE	7
2.3. TECHNICAL SAFETY OBJECTIVE	8
3. FUNDAMENTAL PRINCIPLES	10
3.1. MANAGEMENT RESPONSIBILITIES	10
3.1.1. Safety culture	10
3.1.2. Responsibility of the operating organization	11
3.1.3. Regulatory control and independent verification	12
3.2. STRATEGY OF DEFENCE IN DEPTH	13
3.2.1. Defence in depth	13
3.2.2. Accident prevention	15
3.2.3. Accident mitigation	16
3.3. GENERAL TECHNICAL PRINCIPLES	16
3.3.1. Proven engineering practices	16
3.3.2. Quality assurance	17
3.3.3. Human factors	19
3.3.4. Safety assessment and verification	20
3.3.5. Radiation protection	21
3.3.6. Operating experience and safety research	22
4. SPECIFIC PRINCIPLES	23
4.1. SITING	23
4.1.1. External factors affecting the plant	23
4.1.2. Radiological impact on the public and the local environment ..	26
4.1.3. Feasibility of emergency plans	26
4.1.4. Ultimate heat sink provisions	26

4.2. DESIGN	27
4.2.1. Design process	28
4.2.1.1. Design management	28
4.2.1.2. Proven technology	29
4.2.1.3. General basis for design	29
4.2.2.. General features	30
4.2.2.1. Plant process control systems	30
4.2.2.2. Automatic safety systems	31
4.2.2.3. Reliability targets	32
4.2.2.4. Dependent failures	32
4.2.2.5. Equipment qualification	34
4.2.2.6. Inspectability of safety equipment	34
4.2.2.7. Radiation protection in design	35
4.2.3. Specific features	35
4.2.3.1. Protection against power transient accidents	36
4.2.3.2. Reactor core integrity	37
4.2.3.3. Automatic shutdown systems	38
4.2.3.4. Normal heat removal	38
4.2.3.5. Emergency heat removal	39
4.2.3.6. Reactor coolant system integrity	39
4.2.3.7. Confinement of radioactive material	41
4.2.3.8. Protection of confinement structure	42
4.2.3.9. Monitoring of plant safety status	43
4.2.3.10. Preservation of control capability	43
4.2.3.11. Station blackout	44
4.2.3.12. Control of accidents within the design basis	45
4.3. MANUFACTURING AND CONSTRUCTION	45
4.3.1. Safety evaluation of design	45
4.3.2. Achievement of quality	46
4.4. COMMISSIONING	47
4.4.1. Verification of design and construction	47
4.4.2. Validation of operating and functional test procedures	48
4.4.3. Collecting baseline data	48
4.4.4. Pre-operational plant adjustments	48
4.5. OPERATION	49
4.5.1. Organization, responsibilities and staffing	49
4.5.2. Safety review procedures	50
4.5.3. Conduct of operations	50
4.5.4. Training	52
4.5.5. Operational limits and conditions	53
4.5.6. Normal operating procedures	54

4.5.7. Emergency operating procedures	55
4.5.8. Radiation protection procedures	55
4.5.9. Engineering and technical support of operations	56
4.5.10. Feedback of operating experience	56
4.5.11. Maintenance, testing and inspection	57
4.5.12. Quality assurance in operation	59
4.6. ACCIDENT MANAGEMENT	59
4.6.1. Strategy for accident management	60
4.6.2. Training and procedures for accident management	60
4.6.3. Engineered features for accident management	61
4.7. EMERGENCY PREPAREDNESS	61
4.7.1. Emergency plans	62
4.7.2. Emergency response facilities	62
4.7.3. Assessment of accident consequences and radiological monitoring	63
Appendix: ILLUSTRATION OF DEFENCE IN DEPTH	64
INDEX OF KEYWORDS	69
LIST OF PARTICIPANTS	73