Contents

ACKNOWLEDGMENTS	xi
PREFACE	xiii
l The Riddle of Nuclear Waste	1
The Riddle of Nuclear Waste	1
The Status Quo: Promoting Permanent Disposal The Mistakes of the Past	2
Summary and Overview	6
2	
Understanding the Origins of the Problem	11
Radioactive Waste: Technical Background	13
Radioactive Waste: Historical Background	15
The Current Status of High-Level Radioactive	10
Waste	19
Radioactive Waste: Legal and Regulatory	
Background	21
Conclusion	26
5011111111	
3	
Reliance on Value Judgments in Repository Risk	
Assessment	27
Science and Methodological Value Judgments Quantitative Risk Assessment and Value	28
Judgments	31

vii

viii CONTENTS

	Value Judgments in Estimating Risks Value Judgments in Evaluating Risks Conclusion	34 36 37
Subjective E	4	
Subjective E	stimates of Repository Risks	39
	Repository Risk Estimates Rely on Questionable	
	Value Judgments	40
	Value Judgments about Long-term Risks	42
	Value Judgments about Model Reliability	50
	Value Judgments about Simplification of the	
	Phenomena	53
	Value Judgments about Reliability of Sampling	56
	Value Judgments about Laboratory Predictions	60
	Value Judgments about Fractured,	
	Unsaturated Media	61
	Value Judgments that Interpolations Are	
	Acceptable	66
	Value Judgments that Human Error Is Not Significant	
	Problems with Yucca Mountain versus Problems	67
	with Permanent Disposal	5 0
	with remaining Disposar	72
	5	
Subjective Ev	aluations of Repository Risks	75
	•	, 0
	Value Judgments that a Given Magnitude of	
	Risk Is Acceptable	76
	Value Judgments that Risk Reductions	
	Are Sufficient	80
	Value Judgments that Worst-case Hazards Are Not Credible	
		82
	Value Judgments that Average Risks Are	
	Acceptable Value Indomena et a M. B.	86
	Value Judgments that More Recent Assessments Are More Reliable	
		88
	Value Judgments that Utilitarian Risk Theories Are Just	
	•	90
	Value Judgments about Single-site Studies	94
	Value Judgments that Full Liability Does Not Promote Safety	
	Value Judgments that High-Level Waste Is as	96
	Safe as Ore	^^
	Conclusion	99
		101

	CONTENTS	ix
6		
Problematic Inferences in Assessing Repository Risk	s	103
The Appeal to Ignorance Two-Valued Epistemic Logic and the App	eal	105
to Ignorance		114
Begging the Question		121
The Expertise Inference		127
The Linearity Inference		134
The De Minimis Inference		136
The Consent Inference		139
Specious Accuracy		141
The Inference of the Multiple Maximand		142
Affirming the Consequent The Appeal to Authority		145 149
Conclusion		157
Conclusion		137
7		
Uncertainty: An Obstacle to Geological Disposal		160
We Cannot Adequately Guarantee Yucca		
Mountain Safety		161
Extensive, Nonquantifiable Uncertainty at		
Yucca Mountain Argues against Disposa	म	169
Uncertainty and Permanent Disposal		171
Uncertainty and Permanent Disposal: Oth	er	
Countries		172
Uncertainty and Permanent Disposal: Faul	ty	
Inferences		175
Uncertainty and Permanent Disposal:		
An Objection		177
Uncertainty and Permanent Disposal:		150
Type-II Error Conclusion		178
Conclusion		181
8		
Equity: An Obstacle to Geological Disposal		182
Equity and Permanent Geological Disposa	1	183
Equity and Permanent Geological Disposa	1:	
Objections Based on Utility		185
Equity and Permanent Geological Disposa	1:	
Are There Duties to Future Generations		189
Consent and Permanent Disposal		195
Practical and Legal Considerations against	Disposal	207

Conclusion

CONTENTS

9	
An Alternative to Permanent Geological Disposal	213
Basic Principles	216
The NMRS Option	217
Historical Context	218
Independent Technical and Review Committees	219
A Lottery to Determine NMRS Rotations	222
Regional and Temporary NMRS	223
Public Defender for the Future	227
Full Liability	227
Compensation from the Beginning	229
Negotiated Compensation	229
A Public-legacy Trust	231
Benefits of NMRS Facilities	231
Objections to NMRS Facilities	236
Is a Hundred-year NMRS More Expensive?	239
Discounting Underestimates Repository Risks	241
Does NMRS Unrealistically Seek Zero Risk?	243
Would NMRS Burden the Future?	244
Would NMRS Facilities Become De Facto	211
Permanent?	245
NMRS Uncertainties	246
Do Several Sites for NMRS Create Too Much	210
Anxiety?	247
Does the Quantity of Waste Require Permanent	21,
Disposal?	247
Conclusion	249
NOTES	253
INDEX OF NAMES	329

337

INDEX OF SUBJECTS