THE RENEWABLE ENERGY LANDSCAPE

Preserving scenic values in our sustainable future

Edited by Dean Apostol, James Palmer, Martin Pasqualetti, Richard Smardon and Robert Sullivan

Routledge
Taylor & Francis Group
LONDON AND NEW YORK
CONTENTS

List of Illustrations
   Plates ix
   Figures xi
   Tables xvi

Foreword xvi
Preface xvi
Acknowledgements xviii

1 Introduction to the changing landscapes of renewable energy 1
   1.1 Driving across America in the year 2030 2
   1.2 The challenge 8

PART I
2 Conserving scenery during an energy transition 17
   2.1 Introduction 17
   2.2 Visual elements of renewable energy landscapes 18
   2.3 The early years 23
   Case study 2.1: The San Gorgonio California Wind Study 27
   2.4 Evolving visual impact assessment methods 30
   2.5 Visibility assessment techniques 32
   Case study 2.2: Cape Wind, Massachusetts 32
   2.6 Visual impact thresholds 33
   2.7 Summary 36

3 Managing new energy landscapes in the USA, Canada, and Australia 41
   3.1 Introduction 41
Contents

3.2 US federal and state support for renewable energy 42
3.3 State and local review of renewable energy projects — the crazy quilt 49
3.4 What about utility-scale solar development in North America? 56
3.5 US legal issues with State and local renewable energy siting 57
3.6 Canadian laws, ordinances, regulations, and standards 58
3.7 Renewable energy guidance for Australia 61
3.8 Summary and conclusions 67

4 Adjusting to renewable energy in a crowded Europe 78
4.1 Introduction 78
4.2 Policy context 80
4.3 The European landscape 83
4.4 Overview of methods and approaches to considering landscape in windfarm development 87
4.5 Strategic planning: locational aspects and landscape capacity 88
4.6 Site level planning and design 90
4.7 Landscape and visual impact assessment 93
4.8 Assessment methodology 94
4.9 Taking account of public perceptions and opinions 105
4.10 Conclusions 106

5 Social acceptance of renewable energy landscapes 108
5.1 Introduction 108
5.2 General public reactions to renewable energy 109
5.3 National public response to renewable energy 113
5.4 Offshore wind energy development social factors 124
5.5 Commercial solar energy and social acceptability factors 127
5.6 Social receptivity and geothermal energy development 129
5.7 Summary of acceptability by renewable energy type 130
5.8 Renewable wind energy facilities and visual perception 131

PART II

6 The visual signatures of renewable energy projects 145
6.1 Introduction 145
6.2 Visual contrast 145
6.3 Visibility factors 149
6.4 Visual contrasts of onshore and offshore wind, solar, geothermal, and electric transmission facilities 155
Case study 6.1: Comparing visibility of solar facilities 167
6.5 Summary and conclusions 174

7 Improving the visual fit of renewable energy projects 176
7.1 Introduction 176
7.2 Assessing and incorporating landscape aesthetic characteristics 177
7.3 Recommended best practices 180
Case study 7.1: South Fork Valley PV Solar Project 191
7.4 Summary and conclusion 196

8 Measuring scenic impacts of renewable energy projects 198
8.1 Introduction 198
8.2 Visual Impact Assessment framework 200
8.3 Scope and objectives of the Visual Impact Assessment 201
8.4 Viewshed analysis 203
Case study 8.1: Sinclair-Thomas Matrix – using viewshed analysis and threshold distances to summarize impacts 204
8.5 Baseline conditions 205
Case study 8.2: Cape Cod Commission Visual Impact Assessment guidance for offshore development 207
Case study 8.3: Viewer intercept surveys 210
8.6 Visual Impact Assessment 211
8.7 Cumulative visual impact 215
8.8 Mitigation of visual impacts 217
Case study 8.4: Dry Lake Solar Energy Zone offsite mitigation 219
8.9 Summary 220

9 Visualizing proposed renewable energy projects 223
9.1 Introduction 223
9.2 Guidelines for producing and evaluating simulations 225
9.3 Photomontage production summary 228
Case study 9.1: Visualization study for offshore North Carolina 230
9.4 Animations 233
9.5 Limitations of simulations 234
9.6 Sources of error and inaccuracy in simulations 236
9.7 Other types of simulations 238
9.8 Summary 241

10 Engaging communities in creating new energy landscapes 243
10.1 Introduction 243
10.2 Consultation and participation methods 245
10.3 Participatory process evaluation 248
10.4 Visual impact assessment and the consultation process 248
10.5 Projecting landscape futures and alternatives 249
10.6 Landscape impact equity 250
10.7 Mitigation of impacts 251
10.8 Cumulative impacts 252
10.9 Summary and conclusion 254

11 Conclusion: Policy recommendations for the new energy landscape 258
11.1 Regulatory legal and policy issues 259
11.2 Developing multiple landscape zoning 259
11.3 Determining visibility across landscape zones 260
11.4 Building scenic inventory baselines 260
11.5 Integrated environmental planning for renewable energy 261
11.6 Best practices framework 263
11.7 Tightening visual and scenic analysis methods 265
11.8 Determination of acceptability or undue aesthetic impacts 267
11.9 Potential assessment and mitigation needs 268
11.10 Research needs 269
11.11 Final recommendations 270