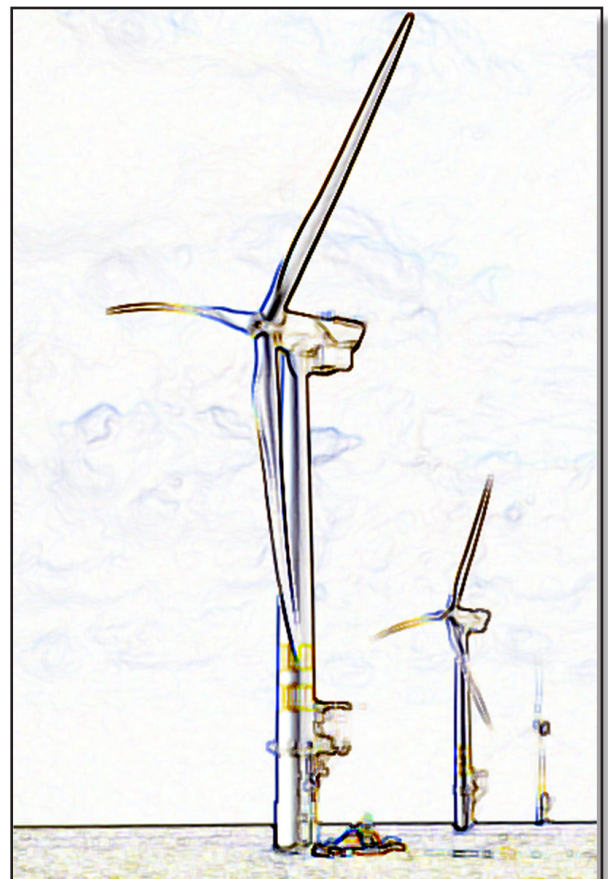
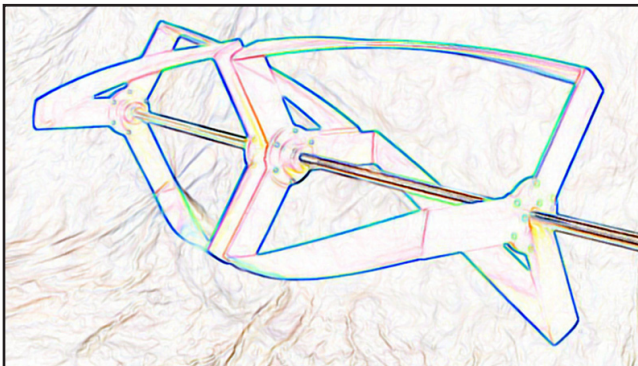
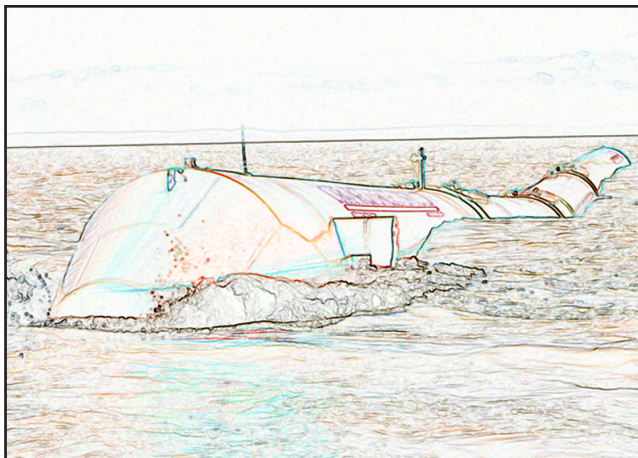




Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf

Final Environmental Impact Statement
October 2007

Volume II: Chapter 5



OCS EIS/EA
MMS 2007-046

**Programmatic Environmental Impact Statement
for Alternative Energy Development and Production
and Alternate Use of Facilities
on the Outer Continental Shelf**

**Final Environmental Impact Statement
October 2007**

Volume II: Chapter 5

**U.S. Department of the Interior
Minerals Management Service**

CONTENTS

NOTATION xxxi

EXECUTIVE SUMMARY ES-1

1 INTRODUCTION 1-1

 1.1 Purpose and Need 1-1

 1.2 Purposes of this Programmatic EIS 1-1

 1.3 Scope of the Analysis..... 1-2

 1.3.1 Public Scoping 1-2

 1.3.2 Scope of This Programmatic EIS..... 1-4

 1.4 Public Comments on the Draft EIS..... 1-12

 1.5 Relationship of the MMS’s Proposed Action to Other MMS Programs,
Policies, and Plans 1-14

 1.6 Reader’s Guide to the Use of This Document 1-15

 1.7 OCS Regulatory Framework..... 1-17

2 PROPOSED ACTION AND ALTERNATIVES 2-1

 2.1 Proposed Action..... 2-1

 2.1.1 Alternative Energy Development on the OCS..... 2-1

 2.1.2 Alternate Use of Existing Structures on the OCS..... 2-2

 2.1.3 An Overview of the Proposed MMS Alternative Energy
and Alternate Use Program..... 2-3

 2.2 Case-by-Case Alternative 2-4

 2.3 No Action Alternative..... 2-5

 2.4 Preferred Alternative..... 2-6

 2.5 Alternatives Considered but Eliminated from Detailed Analysis..... 2-6

 2.5.1 Issuance of Regulations Specific to Energy Source 2-7

 2.5.2 Identifying and Analyzing Specific Areas in Federal Waters
Along the Coast with the Greatest Resource Potential 2-7

 2.5.3 Establishing a Regulatory Program That Granted Access
Rights, But Did Not Regulate Activities 2-7

 2.6 Comparison of Alternatives 2-8

 2.7 MMS’s Proposed Policies and Best Management Practices..... 2-20

 2.7.1 Proposed Policies..... 2-21

 2.7.2 Proposed Best Management Practices 2-23

 2.7.2.1 Preconstruction Planning 2-23

 2.7.2.2 Seafloor Habitats..... 2-23

 2.7.2.3 Marine Mammals 2-24

 2.7.2.4 Fish Resources and Essential Fish Habitat 2-25

 2.7.2.5 Sea Turtles 2-25

 2.7.2.6 Avian Impacts 2-25

CONTENTS (Cont.)

2.7.2.7	Areas of Special Concern	2-26
2.7.2.8	Acoustic Environment	2-26
2.7.2.9	Fisheries	2-26
2.7.2.10	Coastal Habitats	2-27
2.7.2.11	Electromagnetic Fields	2-27
2.7.2.12	Transportation and Vessel Traffic	2-27
2.7.2.13	Visual Resources.....	2-28
2.7.2.14	Cultural Resources	2-28
2.7.2.15	Operations	2-28
3	OVERVIEW OF POTENTIAL ALTERNATIVE ENERGY TECHNOLOGIES ON THE OCS.....	3-1
3.1	Screening of Alternative Energy Technologies	3-1
3.2	Wind.....	3-2
3.3	Wave	3-10
3.3.1	Point Absorbers.....	3-10
3.3.1.1	Point Absorber Considered for Development.....	3-10
3.3.1.2	Point Absorber Considered for Commercialization.....	3-11
3.3.2	Attenuators.....	3-12
3.3.3	Overtopping Devices	3-13
3.3.4	Terminators.....	3-14
3.4	Ocean Currents.....	3-14
3.5	Description of Alternative Energy Activities on the OCS.....	3-17
3.5.1	Technology Testing	3-17
3.5.2	Site Characterization.....	3-18
3.5.3	Facility Construction.....	3-23
3.5.4	Facility Operation	3-25
3.5.5	Facility Decommissioning	3-26
4	AFFECTED ENVIRONMENT.....	4-1
4.1	Regional Planning Areas on the OCS.....	4-1
4.2	Atlantic Region	4-4
4.2.1	Geology.....	4-4
4.2.1.1	General Description and Physiography	4-4
4.2.1.2	Coastal Features and Processes.....	4-9
4.2.1.3	Geologic History	4-10
4.2.1.4	Mineral Resources	4-11
4.2.1.5	Geologic Hazards.....	4-12
4.2.2	Meteorology and Air Quality.....	4-13
4.2.2.1	Meteorology.....	4-13
4.2.2.2	Air Quality	4-15

CONTENTS (Cont.)

4.2.2.3	Regulatory Controls on OCS Activities That Affect Air Quality	4-18
4.2.3	Physical Oceanography.....	4-24
4.2.4	Water Quality.....	4-26
4.2.4.1	Coastal Waters	4-27
4.2.4.2	Marine Waters.....	4-28
4.2.5	Acoustic Environment	4-29
4.2.5.1	Sound Fundamentals.....	4-30
4.2.5.2	Sound Propagation.....	4-34
4.2.5.3	Ambient Ocean Noise	4-36
4.2.5.4	Effects of Sound Exposure.....	4-43
4.2.5.5	Acoustic Receptors of Relevance to OCS Energy Technologies	4-44
4.2.5.6	Regulatory Controls.....	4-44
4.2.5.7	Atlantic Region Acoustic Environment.....	4-46
4.2.6	Hazardous Materials and Waste Management.....	4-47
4.2.6.1	Hazardous Materials Management	4-50
4.2.6.2	Waste Management.....	4-51
4.2.7	Electromagnetic Fields	4-53
4.2.7.1	Current State of EMF Science and Research.....	4-54
4.2.7.2	Human Health Impacts Associated with EMF.....	4-55
4.2.7.3	Ecological Health and Exposure Impacts Associated with EMF	4-56
4.2.8	Marine Mammals.....	4-56
4.2.8.1	Threatened or Endangered Species.....	4-57
4.2.8.2	Nonendangered Species	4-59
4.2.9	Marine and Coastal Birds	4-63
4.2.9.1	Threatened and Endangered Species	4-64
4.2.9.2	Nonendangered Species	4-64
4.2.9.3	Use of Atlantic Coast Habitats by Migratory Birds.....	4-66
4.2.10	Terrestrial Biota	4-67
4.2.11	Fish Resources and Essential Fish Habitat	4-68
4.2.11.1	Threatened or Endangered Fish Species	4-72
4.2.11.2	Other Fish Species	4-75
4.2.11.3	Essential Fish Habitat	4-77
4.2.12	Sea Turtles	4-79
4.2.13	Coastal Habitats	4-83
4.2.14	Seafloor Habitats.....	4-89
4.2.14.1	Topographic Features.....	4-90
4.2.14.2	Benthic Communities.....	4-92
4.2.14.3	Live Bottoms.....	4-92

CONTENTS (Cont.)

4.2.15	Areas of Special Concern	4-93
4.2.15.1	Marine Sanctuaries.....	4-93
4.2.15.2	National Park System.....	4-97
4.2.15.3	National Wildlife Refuges	4-99
4.2.15.4	National Estuarine Research Reserves.....	4-99
4.2.15.5	National Estuary Program.....	4-99
4.2.15.6	Chesapeake Bay Estuary.....	4-100
4.2.16	Military Use Areas.....	4-101
4.2.17	Transportation.....	4-104
4.2.18	Socioeconomic Resources	4-111
4.2.18.1	Regional Population, Employment, and Income	4-111
4.2.18.2	Sociocultural Systems.....	4-113
4.2.18.3	Environmental Justice.....	4-114
4.2.19	Cultural Resources.....	4-116
4.2.20	Land Use and Existing Infrastructure	4-119
4.2.21	Visual Resources.....	4-120
4.2.22	Tourism and Recreation.....	4-121
4.2.23	Fisheries.....	4-121
4.2.23.1	Commercial Fisheries	4-121
4.2.23.2	Recreational Fisheries.....	4-126
4.3	Gulf of Mexico Region.....	4-129
4.3.1	Geology.....	4-129
4.3.1.1	General Description and Physiography	4-129
4.3.1.2	Coastal Features and Processes.....	4-131
4.3.1.3	Geologic History	4-132
4.3.1.4	Mineral Resources	4-133
4.3.1.5	Geologic Hazards.....	4-135
4.3.2	Meteorology and Air Quality.....	4-136
4.3.2.1	Meteorology.....	4-136
4.3.2.2	Air Quality	4-138
4.3.2.3	Regulatory Controls on OCS Activities That Affect Air Quality	4-139
4.3.3	Physical Oceanography.....	4-140
4.3.4	Water Quality.....	4-142
4.3.4.1	Coastal Waters	4-142
4.3.4.2	Marine Waters.....	4-143
4.3.4.3	Effects of Hurricanes Katrina and Rita on Water Quality.....	4-145
4.3.5	Acoustic Environment	4-146
4.3.6	Hazardous Materials and Waste Management.....	4-149
4.3.6.1	Hazardous Materials Management	4-149
4.3.6.2	Waste Management.....	4-150
4.3.7	Electromagnetic Fields	4-153

CONTENTS (Cont.)

4.3.8	Marine Mammals.....	4-153
4.3.8.1	Factors Influencing Cetacean Distribution and Abundance.....	4-153
4.3.8.2	Threatened or Endangered Species.....	4-156
4.3.8.3	Nonendangered Species.....	4-158
4.3.9	Marine and Coastal Birds.....	4-159
4.3.9.1	Threatened and Endangered Species.....	4-159
4.3.9.2	Nonendangered Species.....	4-160
4.3.9.3	Use of Gulf of Mexico Habitats by Migratory Birds....	4-162
4.3.10	Terrestrial Biota.....	4-162
4.3.11	Fish Resources and Essential Fish Habitat.....	4-164
4.3.11.1	Threatened or Endangered Species.....	4-167
4.3.11.2	Other Fish Species.....	4-168
4.3.11.3	Essential Fish Habitat.....	4-172
4.3.12	Sea Turtles.....	4-173
4.3.13	Coastal Habitats.....	4-176
4.3.14	Seafloor Habitats.....	4-180
4.3.14.1	Topographic Features.....	4-181
4.3.14.2	Live-Bottom Areas.....	4-182
4.3.14.3	Pinnacle Trend.....	4-183
4.3.14.4	Submerged Seagrass Beds.....	4-184
4.3.14.5	Other Benthic Habitats.....	4-184
4.3.15	Areas of Special Concern.....	4-185
4.3.15.1	Marine Sanctuaries.....	4-185
4.3.15.2	National Park System.....	4-188
4.3.15.3	National Wildlife Refuges.....	4-189
4.3.15.4	National Estuarine Research Reserves.....	4-189
4.3.15.5	National Estuary Program.....	4-190
4.3.15.6	Effects of Hurricanes on Areas of Special Concern.....	4-190
4.3.16	Military Use Areas.....	4-191
4.3.17	Transportation.....	4-191
4.3.18	Socioeconomic Resources.....	4-199
4.3.18.1	Regional Population, Employment, and Income.....	4-199
4.3.18.2	Sociocultural Systems.....	4-201
4.3.18.3	Environmental Justice.....	4-202
4.3.19	Cultural Resources.....	4-202
4.3.20	Land Use and Existing Infrastructure.....	4-206
4.3.21	Visual Resources.....	4-207
4.3.22	Tourism and Recreation.....	4-208
4.3.23	Fisheries.....	4-208
4.3.23.1	Commercial Fisheries.....	4-208
4.3.23.2	Recreational Fisheries.....	4-211

CONTENTS (Cont.)

4.4	Pacific Region.....	4-214
4.4.1	Geology.....	4-214
4.4.1.1	General Description and Physiography	4-214
4.4.1.2	Coastal Features and Processes.....	4-220
4.4.1.3	Geologic History	4-221
4.4.1.4	Mineral Resources	4-223
4.4.1.5	Geologic Hazards.....	4-223
4.4.2	Meteorology and Air Quality.....	4-225
4.4.2.1	Meteorology.....	4-225
4.4.2.2	Air Quality	4-226
4.4.2.3	Regulatory Controls on OCS Activities That Impact Air Quality	4-229
4.4.3	Physical Oceanography.....	4-230
4.4.4	Water Quality.....	4-231
4.4.4.1	Coastal Waters	4-232
4.4.4.2	Marine Waters.....	4-232
4.4.5	Acoustic Environment	4-233
4.4.6	Hazardous Materials and Waste Management.....	4-234
4.4.6.1	Hazardous Materials Management	4-235
4.4.6.2	Waste Management.....	4-235
4.4.7	Electromagnetic Fields	4-238
4.4.8	Marine Mammals.....	4-238
4.4.8.1	Threatened or Endangered Species.....	4-238
4.4.8.2	Nonendangered Species	4-245
4.4.9	Marine and Coastal Birds	4-247
4.4.9.1	Threatened or Endangered Species.....	4-247
4.4.9.2	Nonendangered Species	4-248
4.4.9.3	Use of Pacific Coast Habitats by Migratory Birds.....	4-251
4.4.10	Terrestrial Biota	4-251
4.4.11	Fish Resources and Essential Fish Habitat	4-252
4.4.11.1	Threatened or Endangered Species.....	4-255
4.4.11.2	Other Fish Species	4-260
4.4.11.3	Essential Fish Habitat	4-263
4.4.12	Sea Turtles	4-265
4.4.13	Coastal Habitats	4-267
4.4.14	Seafloor Habitats.....	4-271
4.4.14.1	Topographic Features.....	4-272
4.4.14.2	Other Benthic Communities	4-272
4.4.15	Areas of Special Concern	4-273
4.4.15.1	Marine Sanctuaries.....	4-273
4.4.15.2	National Park System.....	4-277

CONTENTS (Cont.)

4.4.15.3	National Wildlife Refuges	4-278
4.4.15.4	National Estuarine Research Reserves.....	4-278
4.4.15.5	National Estuary Program.....	4-278
4.4.16	Military Use Areas.....	4-278
4.4.17	Transportation.....	4-281
4.4.18	Socioeconomic Resources	4-286
4.4.18.1	Regional Population, Employment, and Income	4-286
4.4.18.2	Sociocultural Systems.....	4-288
4.4.18.3	Environmental Justice.....	4-288
4.4.19	Cultural Resources.....	4-290
4.4.20	Land Use and Existing Infrastructure.....	4-292
4.4.21	Visual Resources.....	4-293
4.4.22	Tourism and Recreation.....	4-294
4.4.23	Fisheries.....	4-294
4.4.23.1	Commercial Fisheries	4-294
4.4.23.2	Recreational Fisheries.....	4-301
5	POTENTIAL IMPACTS OF ALTERNATIVE ENERGY DEVELOPMENT ON THE OCS AND ANALYSIS OF POTENTIAL MITIGATION MEASURES.....	5-1
5.1	Definitions of Impact Levels	5-1
5.1.1	Impact Levels for Biological and Physical Resources.....	5-1
5.1.2	Impact Levels for Societal Issues	5-2
5.2	Wind Energy Activities on the OCS.....	5-3
5.2.1	Ocean Surface and Sediments.....	5-3
5.2.1.1	Technology Testing	5-4
5.2.1.2	Site Characterization.....	5-4
5.2.1.3	Construction.....	5-5
5.2.1.4	Operation	5-6
5.2.1.5	Decommissioning	5-7
5.2.1.6	Mitigation Measures	5-7
5.2.2	Air Quality.....	5-8
5.2.2.1	Technology Testing	5-8
5.2.2.2	Site Characterization.....	5-8
5.2.2.3	Construction.....	5-9
5.2.2.4	Operation	5-11
5.2.2.5	Decommissioning	5-12
5.2.2.6	Mitigation Measures	5-12
5.2.3	Ocean Currents and Movements.....	5-13
5.2.3.1	Technology Testing	5-13
5.2.3.2	Site Characterization.....	5-14
5.2.3.3	Construction.....	5-14

CONTENTS (Cont.)

	5.2.3.4	Operation	5-14
	5.2.3.5	Decommissioning	5-14
	5.2.3.6	Mitigation Measures	5-14
5.2.4		Water Quality.....	5-15
	5.2.4.1	Technology Testing	5-15
	5.2.4.2	Site Characterization.....	5-15
	5.2.4.3	Construction.....	5-16
	5.2.4.4	Operation	5-17
	5.2.4.5	Decommissioning	5-18
	5.2.4.6	Mitigation Measures	5-18
5.2.5		Acoustic Environment	5-18
	5.2.5.1	Technology Testing	5-18
	5.2.5.2	Site Characterization.....	5-19
	5.2.5.3	Construction.....	5-20
	5.2.5.4	Operation	5-25
	5.2.5.5	Decommissioning	5-29
	5.2.5.6	Mitigation Measures	5-30
5.2.6		Hazardous Materials and Waste Management.....	5-31
	5.2.6.1	Technology Testing	5-32
	5.2.6.2	Site Characterization.....	5-32
	5.2.6.3	Construction.....	5-33
	5.2.6.4	Operation	5-35
	5.2.6.5	Decommissioning	5-35
	5.2.6.6	Mitigation Measures	5-36
5.2.7		Electromagnetic Fields	5-37
	5.2.7.1	Technology Testing	5-37
	5.2.7.2	Site Characterization.....	5-37
	5.2.7.3	Construction.....	5-37
	5.2.7.4	Operation	5-37
	5.2.7.5	Decommissioning	5-38
	5.2.7.6	Mitigation Measures	5-38
5.2.8		Marine Mammals.....	5-38
	5.2.8.1	Technology Testing	5-39
	5.2.8.2	Site Characterization.....	5-39
	5.2.8.3	Construction.....	5-44
	5.2.8.4	Operation	5-47
	5.2.8.5	Decommissioning	5-49
	5.2.8.6	Mitigation Measures	5-50
5.2.9		Marine and Coastal Birds	5-51
	5.2.9.1	Technology Testing	5-52
	5.2.9.2	Site Characterization.....	5-52
	5.2.9.3	Construction.....	5-53
	5.2.9.4	Operation	5-55

CONTENTS (Cont.)

	5.2.9.5	Decommissioning	5-58
	5.2.9.6	Mitigation Measures	5-59
5.2.10	Terrestrial Biota		5-60
	5.2.10.1	Technology Testing	5-60
	5.2.10.2	Site Characterization.....	5-60
	5.2.10.3	Construction.....	5-61
	5.2.10.4	Operation	5-61
	5.2.10.5	Decommissioning	5-63
	5.2.10.6	Mitigation Measures	5-63
5.2.11	Fish Resources and Essential Fish Habitat		5-64
	5.2.11.1	Technology Testing	5-64
	5.2.11.2	Site Characterization.....	5-64
	5.2.11.3	Construction.....	5-67
	5.2.11.4	Operation	5-68
	5.2.11.5	Decommissioning	5-71
	5.2.11.6	Mitigation Measures	5-71
5.2.12	Sea Turtles		5-73
	5.2.12.1	Technology Testing	5-73
	5.2.12.2	Site Characterization.....	5-73
	5.2.12.3	Construction.....	5-76
	5.2.12.4	Operation	5-79
	5.2.12.5	Decommissioning	5-81
	5.2.12.6	Mitigation Measures	5-82
5.2.13	Coastal Habitats		5-83
	5.2.13.1	Technology Testing	5-84
	5.2.13.2	Site Characterization.....	5-84
	5.2.13.3	Construction.....	5-84
	5.2.13.4	Operation	5-86
	5.2.13.5	Decommissioning	5-87
	5.2.13.6	Mitigation Measures	5-87
5.2.14	Seafloor Habitats.....		5-88
	5.2.14.1	Technology Testing	5-89
	5.2.14.2	Site Characterization.....	5-89
	5.2.14.3	Construction.....	5-91
	5.2.14.4	Operation	5-92
	5.2.14.5	Decommissioning	5-94
	5.2.14.6	Mitigation Measures	5-94
5.2.15	Areas of Special Concern		5-95
	5.2.15.1	Technology Testing	5-96
	5.2.15.2	Site Characterization.....	5-97
	5.2.15.3	Construction.....	5-97

CONTENTS (Cont.)

5.2.15.4	Operation	5-99
5.2.15.5	Decommissioning	5-101
5.2.15.6	Mitigation Measures	5-101
5.2.16	Military Use Areas	5-102
5.2.16.1	Technology Testing and Site Characterization	5-102
5.2.16.2	Construction, Operation, and Decommissioning	5-102
5.2.16.3	Mitigation Measures	5-102
5.2.17	Transportation	5-103
5.2.17.1	Technology Testing	5-103
5.2.17.2	Site Characterization	5-103
5.2.17.3	Construction	5-104
5.2.17.4	Operation	5-105
5.2.17.5	Decommissioning	5-106
5.2.17.6	Mitigation Measures	5-107
5.2.18	Socioeconomic Resources	5-107
5.2.18.1	Technology Testing and Site Characterization	5-108
5.2.18.2	Construction, Operation, and Decommissioning	5-109
5.2.18.3	Mitigation Measures	5-111
5.2.19	Cultural Resources	5-111
5.2.19.1	Technology Testing and Site Characterization	5-112
5.2.19.2	Construction	5-112
5.2.19.3	Operation	5-112
5.2.19.4	Decommissioning	5-113
5.2.19.5	Mitigation Measures	5-113
5.2.20	Land Use and Existing Infrastructure	5-114
5.2.20.1	Technology Testing and Site Characterization	5-114
5.2.20.2	Construction, Operation, and Decommissioning	5-114
5.2.20.3	Mitigation Measures	5-116
5.2.21	Visual Resources	5-117
5.2.21.1	Technology Testing	5-119
5.2.21.2	Site Characterization	5-120
5.2.21.3	Construction	5-120
5.2.21.4	Operation	5-122
5.2.21.5	Decommissioning	5-129
5.2.21.6	Mitigation Measures	5-129
5.2.22	Tourism and Recreation	5-131
5.2.22.1	Technology Testing and Site Characterization	5-131
5.2.22.2	Construction, Operation, and Decommissioning	5-131
5.2.22.3	Mitigation Measures	5-132
5.2.23	Fisheries	5-132
5.2.23.1	Technology Testing	5-132
5.2.23.2	Site Characterization	5-133
5.2.23.3	Construction	5-134

CONTENTS (Cont.)

	5.2.23.4	Operation	5-135
	5.2.23.5	Decommissioning	5-137
	5.2.23.6	Mitigation Measures	5-138
5.2.24		Nonroutine Conditions.....	5-138
	5.2.24.1	Technology Testing	5-142
	5.2.24.2	Site Characterization.....	5-142
	5.2.24.3	Construction.....	5-143
	5.2.24.4	Operation	5-143
	5.2.24.5	Decommissioning	5-143
	5.2.24.6	Mitigation Measures	5-143
5.3		Wave Energy Development on the OCS	5-144
	5.3.1	Ocean Surface and Sediments.....	5-144
	5.3.1.1	Technology Testing	5-145
	5.3.1.2	Site Characterization.....	5-146
	5.3.1.3	Construction.....	5-146
	5.3.1.4	Operation	5-148
	5.3.1.5	Decommissioning	5-148
	5.3.1.6	Mitigation Measures	5-149
	5.3.2	Air Quality	5-149
	5.3.2.1	Technology Testing	5-150
	5.3.2.2	Site Characterization.....	5-150
	5.3.2.3	Construction.....	5-151
	5.3.2.4	Operation	5-152
	5.3.2.5	Decommissioning	5-153
	5.3.2.6	Mitigation Measures	5-153
	5.3.3	Ocean Currents and Movements.....	5-154
	5.3.3.1	Technology Testing	5-154
	5.3.3.2	Site Characterization.....	5-154
	5.3.3.3	Construction.....	5-154
	5.3.3.4	Operation	5-155
	5.3.3.5	Decommissioning	5-155
	5.3.3.6	Mitigation Measures	5-155
	5.3.4	Water Quality.....	5-155
	5.3.4.1	Technology Testing	5-155
	5.3.4.2	Site Characterization.....	5-156
	5.3.4.3	Construction.....	5-156
	5.3.4.4	Operation	5-157
	5.3.4.5	Decommissioning	5-158
	5.3.4.6	Mitigation Measures	5-158
	5.3.5	Acoustic Environment	5-158
	5.3.5.1	Technology Testing	5-158
	5.3.5.2	Site Characterization.....	5-159
	5.3.5.3	Construction.....	5-159

CONTENTS (Cont.)

	5.3.5.4	Operation	5-160
	5.3.5.5	Decommissioning	5-161
	5.3.5.6	Mitigation Measures	5-162
5.3.6		Hazardous Materials and Waste Management.....	5-162
	5.3.6.1	Technology Testing	5-163
	5.3.6.2	Site Characterization.....	5-163
	5.3.6.3	Construction.....	5-164
	5.3.6.4	Operation	5-164
	5.3.6.5	Decommissioning	5-165
	5.3.6.6	Mitigation Measures	5-166
5.3.7		Electromagnetic Fields	5-167
5.3.8		Marine Mammals.....	5-167
	5.3.8.1	Technology Testing	5-168
	5.3.8.2	Site Characterization.....	5-169
	5.3.8.3	Construction.....	5-170
	5.3.8.4	Operation	5-171
	5.3.8.5	Decommissioning	5-173
	5.3.8.6	Mitigation Measures	5-174
5.3.9		Marine and Coastal Birds	5-175
	5.3.9.1	Technology Testing	5-175
	5.3.9.2	Site Characterization.....	5-176
	5.3.9.3	Construction.....	5-177
	5.3.9.4	Operation	5-178
	5.3.9.5	Decommissioning	5-180
	5.3.9.6	Mitigation Measures	5-180
5.3.10		Terrestrial Biota	5-181
	5.3.10.1	Technology Testing	5-181
	5.3.10.2	Site Characterization.....	5-181
	5.3.10.3	Construction.....	5-182
	5.3.10.4	Operation	5-182
	5.3.10.5	Decommissioning	5-183
	5.3.10.6	Mitigation Measures	5-183
5.3.11		Fish Resources and Essential Fish Habitat	5-183
	5.3.11.1	Technology Testing	5-184
	5.3.11.2	Site Characterization.....	5-185
	5.3.11.3	Construction.....	5-186
	5.3.11.4	Operation	5-187
	5.3.11.5	Decommissioning	5-190
	5.3.11.6	Mitigation Measures	5-191
5.3.12		Sea Turtles	5-191
	5.3.12.1	Technology Testing	5-192
	5.3.12.2	Site Characterization.....	5-193
	5.3.12.3	Construction.....	5-194

CONTENTS (Cont.)

	5.3.12.4	Operation	5-196
	5.3.12.5	Decommissioning	5-199
	5.3.12.6	Mitigation Measures	5-199
5.3.13		Coastal Habitats	5-200
	5.3.13.1	Technology Testing	5-201
	5.3.13.2	Site Characterization.....	5-201
	5.3.13.3	Construction.....	5-202
	5.3.13.4	Operation	5-203
	5.3.13.5	Decommissioning	5-204
	5.3.13.6	Mitigation Measures	5-204
5.3.14		Seafloor Habitats.....	5-205
	5.3.14.1	Technology Testing	5-205
	5.3.14.2	Site Characterization.....	5-206
	5.3.14.3	Construction.....	5-207
	5.3.14.4	Operation	5-208
	5.3.14.5	Decommissioning	5-210
	5.3.14.6	Mitigation Measures	5-211
5.3.15		Areas of Special Concern	5-211
	5.3.15.1	Technology Testing	5-212
	5.3.15.2	Site Characterization.....	5-213
	5.3.15.3	Construction.....	5-214
	5.3.15.4	Operation	5-215
	5.3.15.5	Decommissioning	5-216
	5.3.15.6	Mitigation Measures	5-217
5.3.16		Military Use Areas.....	5-218
	5.3.16.1	Technology Testing and Site Characterization.....	5-218
	5.3.16.2	Construction, Operation, and Decommissioning.....	5-218
	5.3.16.3	Mitigation Measures	5-218
5.3.17		Transportation.....	5-218
	5.3.17.1	Technology Testing	5-219
	5.3.17.2	Site Characterization.....	5-219
	5.3.17.3	Construction.....	5-219
	5.3.17.4	Operation	5-220
	5.3.17.5	Decommissioning	5-220
	5.3.17.6	Mitigation Measures	5-221
5.3.18		Socioeconomic Resources	5-221
	5.3.18.1	Technology Testing and Site Characterization.....	5-221
	5.3.18.2	Construction, Operation, and Decommissioning.....	5-222
	5.3.18.3	Mitigation Measures	5-224
5.3.19		Cultural Resources.....	5-224
	5.3.19.1	Technology Testing and Site Characterization.....	5-224
	5.3.19.2	Construction.....	5-225
	5.3.19.3	Operation	5-225

CONTENTS (Cont.)

	5.3.19.4	Decommissioning	5-225
	5.3.19.5	Mitigation Measures	5-226
5.3.20		Land Use and Existing Infrastructure	5-226
	5.3.20.1	Technology Testing and Site Characterization	5-227
	5.3.20.2	Construction, Operation, and Decommissioning	5-227
	5.3.20.3	Mitigation Measures	5-228
5.3.21		Visual Resources.....	5-228
	5.3.21.1	Technology Testing	5-229
	5.3.21.2	Site Characterization.....	5-230
	5.3.21.3	Construction.....	5-230
	5.3.21.4	Operation	5-231
	5.3.21.5	Decommissioning	5-233
	5.3.21.6	Mitigation Measures	5-234
5.3.22		Tourism and Recreation.....	5-235
	5.3.22.1	Technology Testing and Site Characterization.....	5-235
	5.3.22.2	Construction, Operation, and Decommissioning.....	5-235
	5.3.22.3	Mitigation Measures	5-236
5.3.23		Fisheries	5-236
	5.3.23.1	Technology Testing	5-237
	5.3.23.2	Site Characterization.....	5-237
	5.3.23.3	Construction.....	5-238
	5.3.23.4	Operation	5-239
	5.3.23.5	Decommissioning	5-241
	5.3.23.6	Mitigation Measures	5-242
5.3.24		Nonroutine Conditions.....	5-242
	5.3.24.1	Technology Testing	5-245
	5.3.24.2	Site Characterization.....	5-245
	5.3.24.3	Construction.....	5-246
	5.3.24.4	Operation	5-246
	5.3.24.5	Decommissioning	5-246
	5.3.24.6	Mitigation Measures	5-246
5.4		Ocean Current Energy Development on the OCS	5-247
5.4.1		Ocean Surface and Sediments.....	5-247
	5.4.1.1	Technology Testing	5-248
	5.4.1.2	Site Characterization.....	5-249
	5.4.1.3	Construction.....	5-249
	5.4.1.4	Operation	5-250
	5.4.1.5	Decommissioning	5-251
	5.4.1.6	Mitigation Measures	5-251
5.4.2		Air Quality	5-251
	5.4.2.1	Technology Testing	5-251
	5.4.2.2	Site Characterization.....	5-252
	5.4.2.3	Construction.....	5-252

CONTENTS (Cont.)

	5.4.2.4	Operation	5-254
	5.4.2.5	Decommissioning	5-255
	5.4.2.6	Mitigation Measures	5-255
5.4.3		Ocean Currents and Movements	5-256
	5.4.3.1	Technology Testing	5-256
	5.4.3.2	Site Characterization	5-256
	5.4.3.3	Construction	5-256
	5.4.3.4	Operation	5-257
	5.4.3.5	Decommissioning	5-257
	5.4.3.6	Mitigation Measures	5-257
5.4.4		Water Quality	5-258
	5.4.4.1	Technology Testing	5-258
	5.4.4.2	Site Characterization	5-258
	5.4.4.3	Construction	5-258
	5.4.4.4	Operation	5-259
	5.4.4.5	Decommissioning	5-260
	5.4.4.6	Mitigation Measures	5-260
5.4.5		Acoustic Environment	5-260
	5.4.5.1	Technology Testing	5-260
	5.4.5.2	Site Characterization	5-260
	5.4.5.3	Construction	5-261
	5.4.5.4	Operation	5-262
	5.4.5.5	Decommissioning	5-263
	5.4.5.6	Mitigation Measures	5-264
5.4.6		Hazardous Materials and Waste Management	5-264
	5.4.6.1	Technology Testing	5-265
	5.4.6.2	Site Characterization	5-265
	5.4.6.3	Construction	5-265
	5.4.6.4	Operation	5-266
	5.4.6.5	Decommissioning	5-267
	5.4.6.6	Mitigation Measures	5-268
5.4.7		Electromagnetic Fields	5-269
5.4.8		Marine Mammals	5-269
	5.4.8.1	Technology Testing	5-270
	5.4.8.2	Site Characterization	5-271
	5.4.8.3	Construction	5-272
	5.4.8.4	Operation	5-273
	5.4.8.5	Decommissioning	5-276
	5.4.8.6	Mitigation Measures	5-276
5.4.9		Marine and Coastal Birds	5-277
	5.4.9.1	Technology Testing	5-278
	5.4.9.2	Site Characterization	5-279
	5.4.9.3	Construction	5-279

CONTENTS (Cont.)

	5.4.9.4	Operation	5-281
	5.4.9.5	Decommissioning	5-282
	5.4.9.6	Mitigation Measures	5-282
5.4.10		Terrestrial Biota	5-283
	5.4.10.1	Technology Testing	5-284
	5.4.10.2	Site Characterization.....	5-284
	5.4.10.3	Construction.....	5-284
	5.4.10.4	Operation	5-285
	5.4.10.5	Decommissioning	5-285
	5.4.10.6	Mitigation Measures	5-285
5.4.11		Fish Resources and Essential Fish Habitat	5-286
	5.4.11.1	Technology Testing	5-286
	5.4.11.2	Site Characterization.....	5-288
	5.4.11.3	Construction.....	5-289
	5.4.11.4	Operation	5-290
	5.4.11.5	Decommissioning	5-292
	5.4.11.6	Mitigation Measures	5-293
5.4.12		Sea Turtles	5-294
	5.4.12.1	Technology Testing	5-294
	5.4.12.2	Site Characterization.....	5-296
	5.4.12.3	Construction.....	5-297
	5.4.12.4	Operation	5-299
	5.4.12.5	Decommissioning	5-301
	5.4.12.6	Mitigation Measures	5-301
5.4.13		Coastal Habitats	5-302
	5.4.13.1	Technology Testing	5-303
	5.4.13.2	Site Characterization.....	5-303
	5.4.13.3	Construction.....	5-304
	5.4.13.4	Operation	5-305
	5.4.13.5	Decommissioning	5-306
	5.4.13.6	Mitigation Measures	5-306
5.4.14		Seafloor Habitats.....	5-307
	5.4.14.1	Technology Testing	5-308
	5.4.14.2	Site Characterization.....	5-308
	5.4.14.3	Construction.....	5-309
	5.4.14.4	Operation	5-310
	5.4.14.5	Decommissioning	5-312
	5.4.14.6	Mitigation Measures	5-313
5.4.15		Areas of Special Concern	5-314
	5.4.15.1	Technology Testing	5-315
	5.4.15.2	Site Characterization.....	5-315
	5.4.15.3	Construction.....	5-315
	5.4.15.4	Operation	5-315

CONTENTS (Cont.)

	5.4.15.5	Decommissioning	5-316
	5.4.15.6	Mitigation Measures	5-316
5.4.16		Military Use Areas.....	5-317
	5.4.16.1	Technology Testing and Site Characterization.....	5-317
	5.4.16.2	Construction, Operation, and Decommissioning.....	5-317
	5.4.16.3	Mitigation Measures	5-317
5.4.17		Transportation.....	5-317
	5.4.17.1	Technology Testing	5-318
	5.4.17.2	Site Characterization.....	5-318
	5.4.17.3	Construction.....	5-318
	5.4.17.4	Operation	5-319
	5.4.17.5	Decommissioning	5-319
	5.4.17.6	Mitigation Measures	5-319
5.4.18		Socioeconomic Resources	5-320
	5.4.18.1	Technology Testing and Site Characterization.....	5-320
	5.4.18.2	Construction, Operation, and Decommissioning.....	5-321
	5.4.18.3	Mitigation Measures	5-323
5.4.19		Cultural Resources.....	5-323
	5.4.19.1	Technology Testing and Site Characterization.....	5-323
	5.4.19.2	Construction.....	5-324
	5.4.19.3	Operation	5-324
	5.4.19.4	Decommissioning	5-324
	5.4.19.5	Mitigation Measures	5-325
5.4.20		Land Use and Existing Infrastructure.....	5-326
	5.4.20.1	Technology Testing and Site Characterization.....	5-326
	5.4.20.2	Construction, Operation, and Decommissioning.....	5-326
	5.4.20.3	Mitigation Measures	5-327
5.4.21		Visual Resources.....	5-327
	5.4.21.1	Technology Testing	5-328
	5.4.21.2	Site Characterization.....	5-328
	5.4.21.3	Construction.....	5-329
	5.4.21.4	Operation	5-330
	5.4.21.5	Decommissioning	5-331
	5.4.21.6	Mitigation Measures	5-332
5.4.22		Tourism and Recreation.....	5-332
	5.4.22.1	Technology Testing and Site Characterization.....	5-332
	5.4.22.2	Construction, Operation, and Decommissioning.....	5-333
	5.4.22.3	Mitigation Measures	5-333
5.4.23		Fisheries.....	5-334
	5.4.23.1	Technology Testing	5-334
	5.4.23.2	Site Characterization.....	5-335
	5.4.23.3	Construction.....	5-335
	5.4.23.4	Operation	5-335

CONTENTS (Cont.)

5.4.23.5	Decommissioning	5-336
5.4.23.6	Mitigation Measures	5-336
5.4.24	Nonroutine Conditions.....	5-336
5.4.24.1	Technology Testing	5-339
5.4.24.2	Site Characterization.....	5-340
5.4.24.3	Construction.....	5-340
5.4.24.4	Operation	5-340
5.4.24.5	Decommissioning	5-340
5.4.24.6	Mitigation Measures	5-341
6	ALTERNATE USES OF EXISTING OIL AND NATURAL GAS PLATFORMS ON THE OCS	6-1
6.1	Number of Existing Oil and Gas Platforms Potentially Available for Alternate Use	6-1
6.2	Environmental Implications for Platforms Left in Place	6-4
6.2.1	Description.....	6-4
6.2.2	Impacts.....	6-6
6.2.3	Mitigation Measures	6-7
6.3	Alternate Uses for Existing Oil and Gas Platforms	6-7
6.3.1	Alternative Energy Production	6-8
6.3.1.1	Description.....	6-8
6.3.1.2	Impacts.....	6-8
6.3.1.3	Mitigation Measures	6-9
6.3.2	Aquaculture.....	6-9
6.3.2.1	Description.....	6-10
6.3.2.2	Impacts.....	6-10
6.3.2.3	Mitigation Measures	6-13
6.3.3	Research and Monitoring.....	6-13
6.3.3.1	Description.....	6-13
6.3.3.2	Impacts.....	6-13
6.3.3.3	Mitigation Measures	6-14
6.4	Other Uses.....	6-14
6.5	Nonroutine Conditions.....	6-14
6.5.1	Industrial Hazards	6-15
6.5.2	Collisions	6-15
6.5.3	Natural Events.....	6-16
6.5.4	Sabotage or Terrorism	6-16
6.5.5	Mitigation Measures	6-17

CONTENTS (Cont.)

7	ANALYSIS OF THE PROPOSED ACTION AND ITS ALTERNATIVES	7-1
7.1	Impacts of the Proposed Action.....	7-1
7.1.1	Offshore Alternative Energy.....	7-1
7.1.2	Alternate Use of Oil and Gas Platforms	7-13
7.2	Impacts of the Case-by-Case Alternative	7-14
7.3	Impacts of the No Action Alternative.....	7-14
7.4	Impacts of the Preferred Alternative.....	7-15
7.5	Impacts of Other Energy Sources	7-16
7.5.1	Coal-Fired Plant Generation	7-17
7.5.2	Natural Gas–Fired Plant Generation.....	7-18
7.5.3	Nuclear Power Plant Generation.....	7-20
7.5.4	Other Land-Based Generation Systems.....	7-22
7.5.4.1	Hydropower	7-22
7.5.4.2	Onshore Wind.....	7-23
7.5.4.3	Onshore Solar	7-24
7.5.4.4	Onshore Geothermal.....	7-25
7.5.4.5	Wood/Biomass.....	7-26
7.5.4.6	Municipal Solid Waste.....	7-27
7.5.4.7	Fuel Cells.....	7-27
7.5.5	Energy Efficiency and Conservation.....	7-28
7.5.6	Cost-Benefit Analysis.....	7-29
7.6	Cumulative Impacts	7-30
7.6.1	Past, Present, and Proposed Actions and Processes Impacting the OCS.....	7-31
7.6.1.1	Alternative Energy Development Projects	7-31
7.6.1.2	Oil and Gas Activities.....	7-35
7.6.1.3	Other Offshore Activities.....	7-37
7.6.1.4	Global Climate Change.....	7-39
7.6.2	Cumulative Impacts of Alternative Energy Development and Alternate Use of Existing Oil and Gas Platforms on the OCS under the Proposed Action.....	7-43
7.6.2.1	Ocean Surface and Sediments.....	7-44
7.6.2.2	Meteorology and Air Quality.....	7-44
7.6.2.3	Ocean Currents and Movement	7-45
7.6.2.4	Water Quality.....	7-46
7.6.2.5	Acoustic Environment	7-47
7.6.2.6	Hazardous Materials and Waste Management.....	7-48
7.6.2.7	Electromagnetic Fields	7-48
7.6.2.8	Marine Mammals.....	7-48
7.6.2.9	Marine and Coastal Birds	7-50
7.6.2.10	Terrestrial Biota	7-51
7.6.2.11	Fish Resources and Essential Fish Habitat	7-52

CONTENTS (Cont.)

7.6.2.12	Sea Turtles	7-53
7.6.2.13	Coastal Habitats	7-54
7.6.2.14	Seafloor Habitats.....	7-54
7.6.2.15	Areas of Special Concern	7-55
7.6.2.16	Military Use Areas.....	7-56
7.6.2.17	Transportation.....	7-57
7.6.2.18	Socioeconomic Resources and Environmental Justice.....	7-57
7.6.2.19	Cultural Resources.....	7-57
7.6.2.20	Land Use and Existing Infrastructure	7-58
7.6.2.21	Visual Resources.....	7-59
7.6.2.22	Tourism and Recreation.....	7-59
7.6.2.23	Fisheries	7-60
7.6.3	Cumulative Impacts of Alternative Energy Development and Alternate Use of Existing Oil and Gas Platforms on the OCS under the Case-by-Case Alternative.....	7-61
7.6.4	Cumulative Impacts of Alternative Energy Development and Alternate Use of Existing Oil and Gas Platforms on the OCS under the Preferred Alternative.....	7-62
7.7	Other NEPA Considerations	7-62
7.7.1	Unavoidable Adverse Impacts.....	7-62
7.7.2	Relationship Between Short-Term Uses of the Environment and Long-Term Productivity	7-63
7.7.3	Irreversible and Irretrievable Commitment of Resources.....	7-63
7.7.4	Mitigation of Adverse Effects.....	7-64
8	CONSULTATION AND COORDINATION.....	8-1
8.1	Public Scoping	8-1
8.2	Government-to-Government Consultation	8-4
8.3	Agency Cooperation, Consultation, and Coordination.....	8-4
8.3.1	Endangered Species Act (ESA) Section 7 Consultation.....	8-5
8.3.2	Essential Fish Habitat Consultation.....	8-5
8.3.3	National Historic Preservation Act Section 106 Consultation.....	8-6
8.4	Distribution of the Draft Programmatic EIS.....	8-7
9	REFERENCES	9-1
10	LIST OF PREPARERS	10-1
11	GLOSSARY	11-1
12	INDEX.....	12-1

CONTENTS (Cont.)

APPENDIX A: Section 388 of the Energy Policy Act of 2005, Public Law 109-58.....	A-1
APPENDIX B: Public Comments on the Draft Programmatic Environmental Impact Statement	B-1
APPENDIX C: Contractor Disclosure Statement	C-1

FIGURES

1.3.2-1	Map of the Hawaiian Islands and the Surrounding Bathymetry.....	1-5
1.3.2-2	Atlantic Coast Planning Areas	1-7
1.3.2-3	Gulf of Mexico Planning Areas	1-8
1.3.2-4	Pacific Coast Planning Areas.....	1-9
1.3.2-5	Offshore Wind Energy Potential.....	1-10
1.3.2-6	Offshore Wave Energy Potential	1-11
1.3.2-7	Location of the Florida Current	1-12
3.2-1	Components of a Wind Turbine.....	3-3
3.2-2	Primary Components and Dimensions of a 2-MW Danish Wind Turbine Generator	3-5
3.2-3	Schematic of Wind Turbine Sizes.....	3-6
3.2-4	Schematic of an Offshore Wind Facility	3-7
3.2-5	Wind Energy Facility Operating off the Coast of Ireland.....	3-9
3.3-1	Point Absorber Wave Energy Conversion (WEC) Device.....	3-11
3.3-2	Attenuator WEC Device	3-12
3.3-3	Overtopping WEC Device	3-13

FIGURES (Cont.)

3.4-1a and b	Visualization of Two Possible Turbine and Anchor Technologies	3-15
3.4-2	SeaFlow Experimental Test	3-16
4.1-1	The Atlantic, Gulf of Mexico, and Pacific Regional Planning Areas on the Outer Continental Shelf	4-2
4.2.1-1	Physiographic Features along the North Atlantic Coast	4-5
4.2.1-2	Major Basins on the Outer Continental Shelf within the Atlantic Region	4-6
4.2.1-3	Physiographic Features along the South Atlantic Coast	4-8
4.2.2-1	Mandatory Class I Federal Areas within 100-km and 200-km Buffers from the Atlantic, Pacific, and Gulf Coastlines	4-19
4.2.5-1	Sound Pressure Levels (dB) of Common Sources	4-33
4.2.5-2	Graphical Representation of the Impacts of Water Temperature and Pressure on Sound Wave Propagation in the SOFAR Layer	4-36
4.2.5-3	Wenz Curves of Natural and Anthropogenic Ocean Noise Sources	4-38
4.2.9-1	Major North American Migration Flyways Showing General Locations of Principal Routes	4-67
4.2.10-1	Ecological Resources in the Atlantic Region	4-69
4.2.16-1	North Atlantic Military Areas	4-102
4.2.16-2	South Atlantic Military Areas	4-103
4.2.17-1	North Atlantic Offshore Dump Sites and Transportation Features	4-106
4.2.17-2	South Atlantic Offshore Dump Sites and Transportation Features	4-107
4.3.1-1	Physiographic Features in the Gulf of Mexico Region	4-130
4.3.1-2	Deltaic Lobes of the Mississippi River	4-134

FIGURES (Cont.)

4.3.9-1	Primary Migration Routes Used by Birds in Passing from North America to Winter Quarters in the West Indies, Central America, and South America	4-163
4.3.10-1	Ecological Resources in the Gulf of Mexico Region.....	4-165
4.3.16-1	Eastern Gulf of Mexico Military Areas	4-192
4.3.16-2	Western Gulf of Mexico Military Areas.....	4-193
4.3.17-1	Eastern Gulf of Mexico Offshore Dump Sites and Transportation Features	4-194
4.3.17-2	Western Gulf of Mexico Offshore Dump Sites and Transportation Features	4-195
4.4.1-1	Physiographic Features along the Northern Pacific Coast.....	4-215
4.4.1-2	Physiographic Features along the Southern Pacific Coast.....	4-217
4.4.1-3	Major Basins on the Outer Continental Shelf in the Pacific Region	4-219
4.4.1-4a	Initial Plate Motion in Three Directions from a Central Core along the Pacific Plate about 160 to 118 Million Years Ago; Figure Shows Spreading along the Rifts of Two Triple Junctions, the Pacific-Izanagi-Farallon and the Pacific-Farallon-Phoenix	4-222
4.4.1-4b	Subduction of the Juan de Fuca and Gorda Plates under the North American Plate Caused by Spreading along the Juan de Fuca and Gorda Ridges.....	4-222
4.4.1-4c	The San Andreas Fault in Relation to the Greater Plate Tectonic Setting of Western North America and the Northeastern Pacific Ocean Basin	4-222
4.4.10-1	Ecological Resources in the Pacific Region	4-253
4.4.16-1	North Pacific Military Areas.....	4-279
4.4.16-2	South Pacific Military Areas.....	4-280

FIGURES (Cont.)

4.4.17-1	North Pacific Offshore Dump Sites and Transportation Features	4-282
4.4.17-2	South Pacific Offshore Dump Sites and Transportation Features	4-283
5.2.21-1	Visual Simulation of View of Horns Rev Wind Facility.....	5-126
5.2.21-2	Postconstruction Photo of Horns Rev Wind Facility	5-126
6.1-1	Oil and Gas Platforms in the Eastern Gulf of Mexico	6-2
6.1-2	Oil and Gas Platforms in the Western Gulf of Mexico.....	6-3
6.1-3	Oil and Gas Platforms Off the California Coast	6-5
8.1-1	Locations of the 10 Cities Where Public Scoping Meetings Were Held for This Programmatic EIS	8-2

TABLES

1.7-1	Federal Legal Authorities Relevant to Activities on the OCS	1-19
1.7-2	Agencies Responsible for Coastal Zone Management Plans in States Bounded by Coastal Waters Adjacent to OCS Regions	1-23
2.6-1	Comparison of Impacts between Alternatives	2-9
4.2.2-1	National Ambient Air Quality Standards (NAAQS) and Maximum Allowable Increments for Prevention of Significant Deterioration (PSD)....	4-16
4.2.2-2	Mandatory Class I Federal Areas Adjacent to the Atlantic, Gulf, and Pacific Coasts	4-20
4.2.5-1	Noise Signatures of Common Vessels.....	4-41
4.2.6-1	Hazardous Materials Likely to Be Used at Alternative Energy Project Sites.....	4-48
4.2.6-2	Wastes Likely to Be Generated at Alternative Energy Project Sites	4-49
4.2.8-1	Marine Mammals in the South Atlantic, Mid-Atlantic, and North Atlantic OCS Waters	4-60

TABLES (Cont.)

4.2.9-1	Federally Endangered and Threatened Birds That May Occur in the Coastal and Marine Areas of the Atlantic.....	4-65
4.2.10-1	Ecoregions and Terrestrial Ecological Setting of the OCS Atlantic Coast.....	4-70
4.2.10-2	Numbers of Terrestrial (Nonmarine) Endangered, Threatened, and Candidate Species Listed under the Endangered Species Act of 1973	4-71
4.2.11-1	Current and Proposed Fishery Management Plans in the Atlantic, Gulf, and Pacific Regions.....	4-73
4.2.11-2	Species for Which Essential Fish Habitat Has Been Designated in the Atlantic Region	4-78
4.2.12-1	Sea Turtles of the U.S. Atlantic Coast	4-80
4.2.15-1	Marine Protected Areas in the Atlantic Region	4-94
4.2.15-2	Watersheds in the National Estuary Program	4-100
4.2.17-1	U.S. Atlantic Port Calls by Port and Commercial Vessel Type for 2005.....	4-108
4.2.17-2	U.S. Atlantic Ports by Cargo Volume for 2004	4-110
4.2.17-3	U.S. Atlantic Coast Cruises by Departure Point	4-111
4.2.18-1	Socioeconomic Environment for the Coastal Economy in the Atlantic Region	4-112
4.2.18-2	Minority and Low-Income Populations in the Atlantic Region.....	4-115
4.2.22-1	Ocean-Related Tourism and Recreation (T&R) Economy, 2004.....	4-122
4.2.23-1	Total Landing Weights and Values for U.S. Commercial Fisheries in 2004	4-123
4.2.23-2	Atlantic Coast Fish Landings by Distance from Shore by State for 2004.....	4-124
4.2.23-3	Species with the Highest Total Commercial Value in the Atlantic Region.....	4-125

TABLES (Cont.)

4.2.23-4	Species with the Highest Total Commercial Landing Weight in the Atlantic Region	4-125
4.2.23-5	Reported Total Landing Weights and Total Landing Values for Major Ports in the Atlantic Region in 2004.....	4-126
4.2.23-6	Total Recreational Fishery Landing Weights for the Top 20 Species in the Atlantic Region	4-127
4.2.23-7	Estimated Numbers for the Top Fish Species Caught by Recreational Anglers in the Atlantic Region during 2005	4-128
4.3.8-1	Marine Mammals in the Gulf of Mexico	4-154
4.3.9-1	Marine and Coastal Birds of the Gulf of Mexico	4-161
4.3.10-1	Ecoregions and Terrestrial Ecological Setting of the Gulf of Mexico.....	4-166
4.3.10-2	Numbers of Terrestrial (Nonmarine) Endangered, Threatened, and Candidate Species Listed under the Endangered Species Act of 1973	4-167
4.3.11-1	Fish Species for Which Essential Fish Habitat Has Been Designated in the Gulf of Mexico Region	4-173
4.3.12-1	Sea Turtles of the Northern Gulf of Mexico.....	4-174
4.3.14-1	Principal Topographic Features of the Gulf of Mexico	4-181
4.3.15-1	Marine Protected Areas in the Gulf of Mexico Region	4-186
4.3.17-1	U.S. Gulf of Mexico Port Calls by Port and Commercial Vessel Type for 2005.....	4-196
4.3.17-2	U.S. Gulf of Mexico Ports by Cargo Volume for 2004.....	4-198
4.3.17-3	U.S. Gulf of Mexico Cruises by Departure Point	4-199
4.3.18-1	Socioeconomic Environment for the Coastal Economy in the Gulf of Mexico Region	4-200
4.3.18-2	Minority and Low-Income Populations in the Gulf Coast Region.....	4-203

TABLES (Cont.)

4.3.22-1	Ocean-Related Tourism and Recreation (T&R) Economy, 2004.....	4-209
4.3.23-1	Total Weights and Values of Commercially Important Fishery Species in the Gulf of Mexico Region	4-210
4.3.23-2	Gulf Coast Fish Landings by Distance from Shore by State for 2004.....	4-211
4.3.23-3	Reported Total Landing Weights and Values for Major Ports in the Gulf of Mexico Region in 2004	4-212
4.3.23-4	Estimated Total Numbers and Total Weights for Fish Species Most Commonly Captured in the Marine Recreational Fishery of the Gulf of Mexico Region.....	4-213
4.4.1-1	Basins within the Southern California Area	4-220
4.4.8-1	Marine Mammals of Southern California, Central California, Northern California, and Washington/Oregon OCS Waters.....	4-239
4.4.9-1	Federally Endangered and Threatened Birds That May Occur in Coastal and Marine Areas of the Eastern Pacific Ocean	4-249
4.4.10-1	Ecoregions and Terrestrial Ecological Setting of the U.S. Pacific Coast	4-254
4.4.10-2	Numbers of Terrestrial (Nonmarine) Endangered, Threatened, or Candidate Species Listed under the Endangered Species Act of 1973	4-255
4.4.11-1	Endangered Species Act Status of West Coast Salmon and Steelhead	4-259
4.4.11-2	Species for Which Essential Fish Habitat Has Been Designated in the Pacific Region.....	4-264
4.4.12-1	Sea Turtles of the U.S. Pacific Coast.....	4-266
4.4.15-1	Marine Protected Areas in the Pacific Region.....	4-274
4.4.17-1	U.S. Pacific Port Calls by Port and Commercial Vessel Type for 2005.....	4-284
4.4.17-2	U.S. Pacific Coast Ports by Cargo Volume for 2004.....	4-285
4.4.17-3	U.S. Pacific Coast Cruises by Departure Point.....	4-285

TABLES (Cont.)

4.4.18-1	Socioeconomic Environment for the Coastal Economy in the Pacific Region	4-287
4.4.18-2	Minority and Low-Income Populations in the Pacific Region	4-289
4.4.22-1	Ocean-Related Tourism and Recreation (T&R) Economy, 2004	4-295
4.4.23-1	Reported Landing Values for Predominant Commercial Fishery Species in the Pacific Region	4-296
4.4.23-2	Landing Weights for Predominant Commercial Fishery Species in the Pacific Region	4-298
4.4.23-3	Pacific Coast Fish Landings by Distance from Shore by State for 2004	4-301
4.4.23-4	Reported Total Landing Weights and Total Landing Values for Major Ports in the Pacific Region in 2004	4-302
5.2.5-1	Above-Water Noise Sources	5-21
5.2.5-2	Below-Water Noise Sources	5-22
5.2.5-3	Typical Noise Levels of Construction Equipment	5-26
5.2.21-1	Visibility Table	5-124
7.1.1-1	Summary of Potential Impacts from Testing, Site Characterization, Construction, Operation, and Decommissioning for Wind, Wave, and Ocean Current Technologies	7-3
7.6.1-1	Proposals and Applications for Alternative Energy Projects on the OCS or in State Waters	7-32
7.6.1-2	Projected Cumulative Oil and Gas Activities in the Gulf of Mexico	7-36
B.3.1	Index by Commentor/Organization	B-319
B.3.2	Index by Organization	B-323
B.3.3	Index by Comment Number	B-328

NOTATION

ACRONYMS AND ABBREVIATIONS

AC	alternating current
ACHP	Advisory Council on Historic Preservation
ACS	American Cetacean Society
AEAU	Alternative Energy and Alternate Use [Program]
APCD	air pollution control district
AUV	autonomous underwater vehicle
AWEA	American Wind Energy Association
BLM	Bureau of Land Management
BMP	best management practice
CAA	Clean Air Act
CAAA	Clean Air Act Amendments of 1990
CADHS	California Department of Health Services
CEC	Commission for Environmental Cooperation
CEI	Coastal Environments, Inc.
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERES	California Environmental Resources Evaluation System
CFR	<i>Code of Federal Regulations</i>
CIMAS	Cooperative Institute for Marine and Atmospheric Studies
CMP	coastal management program
CO	carbon monoxide
CO ₂	carbon dioxide
COA	Corresponding Onshore Area
COWRIE	Collaborative Offshore Wind Research into the Environment
CPUC	California Public Utilities Commission
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DC	direct current
DNREC	Department of Natural Resources and Environmental Control
DOC	U.S. Department of Commerce
DPS	distinct population segment
DTI	Department of Trade and Industry (United Kingdom)
EEZ	Exclusive Economic Zone
EFH	essential fish habitat
EIA	Energy Information Administration
EIS	Environmental Impact Statement
ELF	extremely low frequency

EMF	electromagnetic field
EPAct	Energy Policy Act [of 2005]
EPRI	Electric Power Research Institute
EPU	energy protection unit
ESA	Endangered Species Act
ESP	electric service platform
FAA	Federal Aviation Administration
FCMA	Fishery Conservation and Management Act
FERC	Federal Energy Regulatory Commission
FMC	fishery management council
FMP	fishery management plan
FOSC	Federal On-Scene Coordinator
FR	<i>Federal Register</i>
FWPCA	Federal Water Pollution Control Act
GMFMC	Gulf of Mexico Fishery Management Council
GOM	Gulf of Mexico
GSA	Geographic Society of America
GSMFC	Gulf States Marine Fisheries Commission
HAPC	habitat area of particular concern
HDD	horizontal directional drilling
HMR	Hazardous Materials Regulation
HMTA	Hazardous Materials Transportation Act
ICE	internal combustion engine
ICNIRP	International Commission on Non-ionizing Radiation Protection
IPCC	Intergovernmental Panel on Climate Change
LCWCRTF	Louisiana Coastal Wetlands Conservation and Restoration Task Force
LIOWP	Long Island Offshore Wind Park
LNG	liquefied natural gas
LOOP	Louisiana Offshore Oil Port
LPB	Lake and Peninsula Borough
LWR	light water reactor
MAFMC	Mid-Atlantic Fishery Management Council
MARAD	Maritime Administration
MBES	multibeam echosounder
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MPA	marine protected area
MPRSA	Marine Protection Research and Sanctuaries Act
MSD	marine sanitation device
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act

N ₂ O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAS	National Academy of Sciences
NAST	National Assessment Synthesis Team
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NIH	National Institutes of Health
NMFS	National Marine Fisheries Service
NO ₂	nitrogen dioxide
NO _x	nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOSC	U.S. Naval Ocean Systems Center
NPDES	National Pollutant Discharge Elimination System
NPFMC	North Pacific Fishery Management Council
NPS	National Park Service
NREL	National Renewable Energy Laboratory
NTL	Notice to Lessees
NVIC	Navigation and Vessel Inspection Circular
NWA	National Wilderness Area
NWR	National Wildlife Refuge
O ₃	ozone
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OTEC	Ocean Thermal Energy Conversion
OWC	oscillating water column
PAH	polynuclear aromatic hydrocarbon
PAM	passive acoustic monitor
Pb	lead
PCB	polychlorinated biphenyl
PM ₁₀	particulate matter less than 10 microns in diameter
PM _{2.5}	fine particulates less than 2.5 microns in diameter
PSD	Prevention of Significant Deterioration
PTE	potential to emit
PV	photovoltaic
RCRA	Resource Conservation and Recovery Act
RICS	Royal Institution of Chartered Surveys
ROD	Record of Decision
ROW	right-of-way
RUE	right-of-use and easement
SBES	single-beam echosounder

SECA	Solid State Energy Conversion Alliance
SHPO	State Historic Preservation Office
SO ₂	sulfur dioxide
SO _x	sulfur oxides
SOFAR	Sound Fixing and Ranging (Layer)
SPL	sound pressure level
THPO	Tribal Historic Preservation Office
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USDOC	U.S. Department of Commerce
USDOD	U.S. Department of Defense
USDOE	U.S. Department of Energy
USDOI	U.S. Department of the Interior
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VCS	voltage source converter
VOC	volatile organic compound
WEC	wave energy conversion
WTG	wind turbine generator
ZOI	zone of influence

UNITS OF MEASURE

μm	micrometer(s)	L	liter(s)
μPa	microPascal	lb	pound(s)
μPa-m	microPascal-meter		
		m	meter(s)
bbl	barrel(s)	m ³	cubic meter(s)
bcf	billion cubic feet	mg	milligram(s)
bpd	barrel(s) per day	mG	milliGauss
Btu	British thermal unit	mi	mile(s)
		mi ²	square mile(s)
°C	degree(s) Centigrade	min	minute(s)
		mL	milliliters
d	day(s)	mph	mile(s) per hour
dB	decibel(s)	ms	millisecond(s)
dB(A)	decibel(s) A-weighted	MT	metric ton(s)
DWT	deadweight ton(s)	MW	megawatt(s)
		MW(e)	megawatt(s), electric
°F	degree(s) Fahrenheit	MWh	megawatt hour(s)
ft	foot (feet)		
		Pa	Pascal(s)
gal	gallon(s)	ppb	part(s) per billion
		ppm	part(s) per million
h	hour(s)	ppt	part(s) per thousand
ha	hectare(s)		
hp	horsepower	rpm	revolution(s) per minute
Hz	hertz		
		s	second(s)
in.	inch(es)		
		tcf	trillion cubic feet
kg	kilogram(s)		
kHz	kilohertz	yd ³	cubic yard(s)
km	kilometer(s)	yr	year(s)
km ²	square kilometer(s)		
kV	kilovolt(s)		
kW	kilowatt(s)		
kWh	kilowatt hour(s)		

