



United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Washington, D.C. 20240
<http://www.blm.gov>



December 2010

In Reply Refer To:
1610 (300)

Dear Reader:

Attached for your review and comment is the Draft Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States. This document was prepared by the Bureau of Land Management (BLM) and the Department of Energy (DOE) as co-lead agencies. The BLM and DOE prepared this document in consultation with cooperating agencies and in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended; the Council on Environmental Quality, DOE, and Department of the Interior regulations implementing NEPA (40 CFR Parts 1500-1508, 10 CFR Part 1021, 43 CFR Part 46); and the Federal Land Policy and Management Act of 1976, as amended.

The Draft PEIS assesses environmental, social, and economic impacts associated with the development and implementation of agency-specific programs and guidance that would facilitate environmentally responsible utility-scale solar energy development in six southwestern states (Arizona, California, Colorado, Nevada, New Mexico, and Utah). Through the Draft PEIS, the BLM is evaluating a new Solar Energy Program that would be applicable to utility-scale solar energy development on BLM-administered lands in the six-state area. The DOE is evaluating new program guidance relevant to DOE-supported solar projects on Federal, state, tribal, or private lands.

The BLM and DOE encourage the public to provide information and comments pertaining to the analysis presented in the Draft PEIS. The public is invited to submit their comments for consideration in identifying environmental issues, existing resource data, and industry interest with respect to utility-scale solar energy development. The BLM and DOE are particularly interested in feedback concerning the appropriateness of identifying proposed solar energy zones, or portions thereof, as priority areas for utility-scale solar energy development. The BLM and DOE are also interested in feedback concerning the categories of land to be excluded from solar energy development and on policies and required design features applicable to this development. It is possible for exclusions and policies to vary by geographic area, e.g., special recreation management areas could be excluded in some areas, but not others; sensitive species

habitat could be excluded entirely, or applications could be accepted but be required to conform to existing or new management prescriptions.

As a member of the public, your timely comments on the Draft PEIS will help formulate the Final PEIS. Comments will be accepted for ninety (90) calendar days following the Environmental Protection Agency's publication of its Notice of Availability in the *Federal Register*. The BLM and DOE can best utilize your comments and resource information submissions if received within the review period. Comments received after the end of the review period will be considered to the extent practicable.

Comments may be submitted electronically on the online comment form available at the project Web site: <http://solareis.anl.gov>. To facilitate analysis of comments and information submitted, we strongly encourage you to submit comments in an electronic format. Comments may also be submitted by mail to Solar Energy Draft PEIS, Argonne National Laboratory, 9700 S. Cass Avenue—EVS/240, Argonne, Illinois 60439.

Your review and comments on the content of the Draft PEIS are critical to the success of this effort. We request that your comments be as specific as possible. Comments are more helpful if they reference a section or page number of the Draft PEIS and include suggested changes, additional information sources, or alternative methodologies. Your comments will receive a response from the BLM and/or DOE. Comments containing only opinion or preferences will be considered as part of the decision-making process, but will not receive individual responses.

Before including your address, phone number, email address, or other personal identifying information in your comment, be advised that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

In addition to written comments, public meetings to take public comments will be announced through local media and Web sites. Public meetings are currently planned for the following locations:

Alamosa, Colorado	Las Vegas, Nevada
Barstow, California	Ontario, California
Caliente, Nevada	Palm Springs, California
Cedar City, Utah	Phoenix, Arizona
El Centro, California	Salt Lake City, Utah
Goldfield, Nevada	Tucson, Arizona
Las Cruces, New Mexico	Washington, D.C.

Copies of the Draft PEIS have been sent to affected Federal, state, and local government agencies and applicable tribal governments. Requests for additional information on the Draft Solar PEIS, including requests for copies of the document, should be directed to Linda Resseguie, BLM Washington Office, by email at linda_resseguie@blm.gov, or by telephone at 202-912-7337; or Jane Summerson, DOE Solar PEIS Document Manager, by email at

Jane.summerson@ee.doe.gov, or by telephone at 202-287-6188. You may also visit the Solar Energy Development PEIS Web site at <http://solareis.anl.gov>.

Thank you for your continued interest in the PEIS for Solar Energy Development in Six Southwestern States. We appreciate the information and suggestions you contribute to the NEPA and planning process.

Sincerely,

A handwritten signature in black ink, appearing to read "M. Nedd", written over a horizontal line.

Michael D. Nedd
Assistant Director
Minerals and Realty Management

Draft Programmatic Environmental Impact Statement for

Solar Energy Development in Six Southwestern States



Volume 1
Reader's Guide, Executive Summary
Chapters 1–7, 14–16

On the cover:

Typical Solar Fields for Various Technology Types (clockwise from upper left):
Solar Parabolic Trough (Source: Hosoya et al. 2008),
Solar Power Tower (Credit: Sandia National Laboratories. Source: NREL 2010a),
Photovoltaic (Credit: Arizona Public Service. Source: NREL 2010b), and
Dish Engine (Credit: R. Montoya. Source: Sandia National Laboratories 2008).
Reference citations are available in Chapter 1.

Background photo: Parabolic trough facility from an elevated viewpoint
(Credit: Argonne National Laboratory)

Draft Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States (DES 10-59; DOE/EIS-0403)

Responsible Agencies: The U.S. Department of the Interior (DOI) Bureau of Land Management (BLM) and the U.S. Department of Energy (DOE) are co-lead agencies. Nineteen cooperating agencies participated in the preparation of this PEIS: U.S. Department of Defense; U.S. Bureau of Reclamation; U.S. Fish and Wildlife Service; U.S. National Park Service; U.S. Environmental Protection Agency, Region 9; U.S. Army Corps of Engineers, South Pacific Division; Arizona Game and Fish Department; California Energy Commission; California Public Utilities Commission; Nevada Department of Wildlife; N-4 Grazing Board, Nevada; Utah Public Lands Policy Coordination Office; Clark County, Nevada, including Clark County Department of Aviation; Dona Ana County, New Mexico; Esmeralda County, Nevada; Eureka County, Nevada; Lincoln County, Nevada; Nye County, Nevada; and Saguache County, Colorado.

Locations: Arizona, California, Colorado, Nevada, New Mexico, and Utah.

Contacts: *For further information about this PEIS, contact:* Linda Resseguie, BLM Washington Office, e-mail: linda_resseguie@blm.gov, phone: (202) 912-7337; or Jane Summerson, DOE Solar PEIS Document Manager, e-mail: jane.summerson@ee.doe.gov, phone: (202) 287-6188; or visit the PEIS Web site at <http://solareis.anl.gov>.

Abstract: The BLM and DOE are considering taking actions to facilitate solar energy development in compliance with various orders, mandates, and agency policies. For the BLM, these actions include the evaluation of a new BLM Solar Energy Program applicable to all utility-scale solar energy development on BLM-administered lands in six southwestern states (Arizona, California, Colorado, Nevada, New Mexico, and Utah). For DOE, they include the evaluation of developing new program guidance relevant to DOE-supported solar projects. The Draft PEIS assesses the environmental, social, and economic effects of the agencies' proposed actions and alternatives.

For the BLM, the Draft PEIS analyzes a no action alternative, under which solar energy development would continue on BLM-administered lands in accordance with the terms and conditions of the BLM's existing solar energy policies, and two action alternatives for implementing a new BLM Solar Energy Program. Under the solar energy development program alternative (BLM's preferred alternative), the BLM would establish a new Solar Energy Program of administration and authorization policies and required design features and would exclude solar energy development from certain BLM-administered lands. Under this alternative, approximately 22 million acres of BLM-administered lands would be available for right-of-way (ROW) application. A subset of these lands, about 677,400 acres, would be identified as solar energy zones (SEZs), or areas where the BLM would prioritize solar energy and associated transmission infrastructure development. Under the SEZ program alternative, the same policies and design features would be adopted, but development would be excluded from all BLM-administered lands except those located within the SEZs.

For DOE, the Draft PEIS analyzes a no action alternative, under which DOE would continue to conduct environmental reviews of DOE-funded solar projects on a case-by-case basis, and one action alternative, under which DOE would develop programmatic guidance to further integrate environmental considerations into its analysis and selection of solar projects that it will support.

The EPA Notice of Availability (NOA) of the Draft PEIS was published in the *Federal Register* on December 17, 2010. Comments on the Draft PEIS are due by March 17, 2011.

SOLAR PEIS CONTENTS

VOLUME 1

Reader's Guide

Executive Summary

Chapter 1: Introduction

Chapter 2: Description of Alternatives and Reasonably Foreseeable Development Scenario

Chapter 3: Overview of Solar Energy Power Production Technologies, Development, and Regulation

Chapter 4: Affected Environment

Chapter 5: Impacts of Solar Energy Development and Potential Mitigation Measures

Chapter 6: Analysis of BLM's Solar Energy Development Alternatives

Chapter 7: Analysis of DOE's Alternatives

Chapter 14: Consultation and Coordination Undertaken To Support Preparation of the PEIS

Chapter 15: List of Preparers

Chapter 16: Glossary

VOLUME 2

Chapter 8: Affected Environment and Impact Assessment for Proposed Solar Energy Zones in Arizona

VOLUME 3, Parts 1 and 2

Chapter 9: Affected Environment and Impact Assessment for Proposed Solar Energy Zones in California

VOLUME 4

Chapter 10: Affected Environment and Impact Assessment for Proposed Solar Energy Zones in Colorado

VOLUME 5, Parts 1 and 2

Chapter 11: Affected Environment and Impact Assessment for Proposed Solar Energy Zones in Nevada

VOLUME 6

Chapter 12: Affected Environment and Impact Assessment for Proposed Solar Energy Zones in New Mexico

VOLUME 7

Chapter 13: Affected Environment and Impact Assessment for Proposed Solar Energy Zones in Utah

VOLUME 8

Appendix A: Current and Proposed Bureau of Land Management Solar Energy Development Policies and Design Features

Appendix B: Active Solar Applications

Appendix C: Proposed BLM Land Use Plan Amendments under the BLM Action Alternatives of the Solar Energy Development Programmatic Environmental Impact Statement

Appendix D: Summary of Regional Initiatives and State Plans for Solar Energy Development and Transmission Development to Support Renewable Energy Development

Appendix E: Methods for Estimating Reasonably Foreseeable Development Scenarios for Solar Energy Development

Appendix F: Solar Energy Technology Overview

Appendix G: Transmission Constraint Analysis

Appendix H: Federal, State, and County Requirements Potentially Applicable to Solar Energy Projects

Appendix I: Ecoregions of the Six-State Study Area and Land Cover Types of the Proposed Solar Energy Zones

Appendix J: Special Status Species Associated with BLM's Alternatives in the Six-State Study Area

Appendix K: Government-to-Government and Cultural Resource Consultations

Appendix L: GIS Data Sources and Methodology

Appendix M: Methodologies and Data Sources for the Analysis of Impacts of Solar Energy Development on Resources

Appendix N: Viewshed Maps for Proposed Solar Energy Zones

VOLUME 1 CONTENTS

1		
2		
3		
4	<u>NOTATION</u>	xxvii
5		
6	<u>ENGLISH/METRIC AND METRIC/ENGLISH EQUIVALENTS</u>	xxxix
7		
8	<u>EXECUTIVE SUMMARY</u>	ES-1
9		
10	<u>ES.1 Background</u>	ES-1
11	<u>ES.2 BLM’S Proposed Action</u>	ES-1
12	<u>ES.2.1 BLM’s Purpose and Need</u>	ES-2
13	<u>ES.2.2 BLM’s Scope of Analysis</u>	ES-3
14	<u>ES.2.3 BLM’s Alternatives</u>	ES-5
15	ES.2.3.1 Solar Energy Development Program Alternative	ES-6
16	ES.2.3.2 Solar Energy Zone Program Alternative	ES-11
17	ES.2.3.3 No Action Alternative.....	ES-12
18	ES.2.3.4 Reasonably Foreseeable Solar Energy Development	ES-12
19	<u>ES.2.4 Summary of Impacts of BLM’s Alternatives</u>	ES-14
20	<u>ES.2.5 BLM’s Preferred Alternative</u>	ES-29
21	<u>ES.3 DOE’S Proposed Action</u>	ES-29
22	<u>ES.3.1 DOE’s Purpose and Need</u>	ES-36
23	<u>ES.3.2 DOE’s Scope of Analysis</u>	ES-37
24	<u>ES.3.3 DOE’s Alternatives</u>	ES-37
25	ES.3.3.1 DOE’s Proposed Action.....	ES-37
26	ES.3.3.2 DOE’s No Action Alternative.....	ES-38
27	<u>ES.3.4 Summary of Impacts of DOE’s Alternatives</u>	ES-38
28	<u>ES.4 Public Involvement, Consultation, and Coordination</u>	ES-40
29	<u>ES.5 References</u>	ES-41
30		
31	<u>1 INTRODUCTION</u>	1-1
32		
33	<u>1.1 Applicable Federal Orders and Mandates</u>	1-2
34	1.1.1 Executive Order 13212	1-2
35	1.1.2 Energy Policy Act of 2005.....	1-2
36	1.1.3 Energy Independence and Security Act of 2007	1-2
37	1.1.4 DOI Secretarial Order 3285A1	1-3
38	1.1.5 Executive Order 13514.....	1-3
39	<u>1.2 Overview of Solar Energy Technologies and Resources Considered</u>	
40	<u>in the PEIS</u>	1-3
41	<u>1.3 BLM Requirements and Objectives for the PEIS</u>	1-6
42	1.3.1 BLM’s Purpose and Need.....	1-7
43	1.3.2 BLM’s Decisions To Be Made	1-8
44	1.3.3 Authorization Process for Solar Energy Development	
45	on BLM Lands	1-9
46	1.3.4 BLM Land Use Planning Process.....	1-10

CONTENTS (Cont.)

1
2
3
4 1.3.5 BLM Land Withdrawals 1-12
5 1.3.6 BLM Scope of the Analysis 1-13
6 1.3.6.1 Programmatic Scope 1-14
7 1.3.6.2 Proposed Solar Energy Zone Scope..... 1-14
8 1.3.7 BLM Planning Criteria 1-15
9 1.3.8 BLM Requirements for Further Environmental Analysis 1-16
10 1.4 DOE Requirements and Objectives for the PEIS 1-17
11 1.4.1 DOE’s Purpose and Need 1-18
12 1.4.2 DOE’s Decisions To Be Made..... 1-19
13 1.4.3 DOE’s Scope of the Analysis 1-19
14 1.5 Cooperating Agencies 1-19
15 1.6 Relationship of the BLM’s Proposed Program and DOE’s Proposed
16 Strategy to Other Programs, Policies, and Plans..... 1-21
17 1.6.1 Renewable Portfolio Standards and Other Regional and State
18 Initiatives 1-21
19 1.6.2 Related Initiatives 1-21
20 1.6.2.1 Energy Corridor Designation..... 1-22
21 1.6.2.2 Landscape Conservation Cooperatives and BLM’s
22 Proposed Landscape Approach..... 1-23
23 1.6.2.3 California Desert Renewable Energy
24 Conservation Plan 1-24
25 1.6.2.4 Arizona Restoration Design Energy Project 1-24
26 1.6.2.5 Wind Energy Development PEIS 1-24
27 1.6.2.6 Geothermal PEIS 1-25
28 1.7 Organization of the Programmatic Environmental Impact Statement 1-25
29 1.8 References 1-28
30
31 2 DESCRIPTION OF ALTERNATIVES AND REASONABLY
32 FORSEEABLE DEVELOPMENT SCENARIO 2-1
33
34 2.1 Introduction 2-1
35 2.2 BLM’s Alternatives 2-2
36 2.2.1 No Action Alternative..... 2-2
37 2.2.2 BLM Action Alternatives 2-4
38 2.2.2.1 Program Components Common to Both BLM
39 Action Alternatives 2-4
40 2.2.2.2 Solar Energy Development Program Alternative 2-6
41 2.2.2.3 SEZ Program Alternative..... 2-14
42 2.3 DOE’s Alternatives 2-17
43 2.3.1 No Action Alternative..... 2-17
44 2.3.2 DOE’s Proposed Action: Programmatic Environmental
45 Guidance Alternative 2-18
46 2.3.2.1 Scope of DOE’s Proposed Action 2-18

CONTENTS (Cont.)

1			
2			
3			
4	2.3.2.2	DOE’s Proposed Mitigation Recommendations under the Programmatic Environmental Guidance Alternative	2-18
5			
6			
7	<u>2.4</u>	<u>Description of Reasonably Foreseeable Development Scenario</u>	2-19
8	2.4.1	Capacity Estimates Based on ReEDS Model	2-19
9	2.4.2	Capacity Estimates Based on RPS Values.....	2-21
10	2.4.3	RFDS for This PEIS	2-21
11	<u>2.5</u>	<u>Alternatives and Issues Considered but Eliminated from Detailed</u>	
12	<u>Analysis</u>	2-23
13	2.5.1	Distributed Generation.....	2-24
14	2.5.2	Conservation and Demand-Side Management	2-25
15	2.5.3	Analysis of Life-Cycle Impacts of Solar Energy Development	2-25
16	2.5.4	Analysis of Development on Other Federal, State, or Private Lands	2-26
17			
18	2.5.5	Restricting Development to Previously Disturbed Lands.....	2-26
19	2.5.6	Restricting Development to Populated Areas	2-27
20	2.5.7	Restricting Development to the Fast-Track Project Applications ...	2-27
21	2.5.8	Analysis of Development on the Maximum Amount of Public Lands Allowable	2-28
22			
23	2.5.9	Changes to BLM’s Proposed Solar Energy Zones	2-29
24	2.5.10	Other Suggested Alternatives	2-29
25	<u>2.6</u>	<u>References</u>	2-36
26			
27	<u>3</u>	<u>OVERVIEW OF SOLAR ENERGY POWER PRODUCTION</u>	
28		<u>TECHNOLOGIES, DEVELOPMENT, AND REGULATION</u>	3-1
29			
30	<u>3.1</u>	<u>Technologies</u>	3-1
31	3.1.1	Parabolic Trough.....	3-2
32	3.1.2	Power Tower.....	3-4
33	3.1.3	Dish Systems.....	3-6
34	3.1.4	Photovoltaic Systems	3-8
35	3.1.5	Comparison of Technologies and Assumptions Used for Environmental Analyses	3-10
36			
37	3.1.5.1	Land Requirement Assumptions.....	3-12
38	3.1.5.2	Water Use	3-12
39	3.1.5.3	Chemicals/Hazardous Materials	3-14
40	<u>3.2</u>	<u>Development Process Overview for All Technologies</u>	3-14
41	3.2.1	Site Characterization.....	3-14
42	3.2.2	Site Preparation and Construction	3-16
43		3.2.2.1 Site Preparation.....	3-17
44		3.2.2.2 Site Construction.....	3-19
45	3.2.3	Operations	3-21
46	3.2.4	Decommissioning/Reclamation	3-22

CONTENTS (Cont.)

1
2
3
4 3.2.5 Transmission Lines 3-23
5 3.3 Laws and Executive Orders Potentially Applicable to Solar Energy
6 and Transmission Line Projects 3-25
7 3.4 Transportation Considerations 3-29
8 3.4.1 Construction 3-29
9 3.4.2 Operations 3-30
10 3.4.3 Decommissioning/Reclamation 3-30
11 3.5 Hazardous Materials and Wastes Associated with Solar Energy Facilities.... 3-31
12 3.5.1 Construction 3-31
13 3.5.1.1 Hazardous Materials 3-31
14 3.5.1.2 Construction Wastes 3-31
15 3.5.2 Operations 3-34
16 3.5.2.1 Hazardous Materials 3-34
17 3.5.2.2 Operations Wastes 3-35
18 3.5.3 Decommissioning Wastes 3-43
19 3.6 Health and Safety Aspects of Solar Energy Projects 3-44
20 3.6.1 Occupational Hazards 3-44
21 3.6.2 Public Safety 3-45
22 3.6.3 Electric and Magnetic Fields 3-46
23 3.7 Existing Agency Processes and Guidance 3-48
24 3.7.1 Current BLM Process for Issuing Solar Development ROWs 3-48
25 3.7.2 Options for ROW Processing 3-49
26 3.7.3 Existing Mitigation Guidance Relevant or Applicable
27 to Solar Energy Development 3-51
28 3.7.3.1 BLM Guidance 3-51
29 3.7.3.2 DOE Guidance 3-53
30 3.7.3.3 Other Guidance 3-53
31 3.8 References 3-54
32
33 4 AFFECTED ENVIRONMENT 4-1
34
35 4.1 Introduction 4-1
36 4.2 Lands and Realty 4-2
37 4.3 Specially Designated Areas and Lands with
38 Wilderness Characteristics 4-3
39 4.4 Rangeland Resources 4-4
40 4.4.1 Livestock Grazing 4-4
41 4.4.2 Wild Horses and Burros 4-4
42 4.4.3 Wildland Fire 4-13
43 4.5 Recreation 4-13
44 4.6 Military and Civilian Aviation 4-15
45 4.7 Geologic Setting and Soil Resources 4-17
46 4.7.1 Geologic Setting 4-17

CONTENTS (Cont.)

1			
2			
3			
4	4.7.2	Geologic Hazards.....	4-17
5		4.7.2.1 Seismicity.....	4-17
6		4.7.2.2 Volcanic Activity.....	4-26
7		4.7.2.3 Mass Wasting.....	4-29
8		4.7.2.4 Land Subsidence.....	4-29
9	4.7.3	Soil Resources.....	4-32
10		4.7.3.1 Soil Taxonomy.....	4-32
11		4.7.3.2 Biological Soil Crusts.....	4-32
12		4.7.3.3 Desert Pavement.....	4-34
13		4.7.3.4 Wind Erosion of Soils.....	4-35
14	4.8	Minerals	4-35
15	4.9	Water Resources	4-37
16	4.9.1	Surface Water Resources.....	4-37
17		4.9.1.1 Hydrologic Regions.....	4-37
18		4.9.1.2 Wild and Scenic Rivers.....	4-39
19		4.9.1.3 Floodplains, Ephemeral Streams, and Wetlands.....	4-49
20		4.9.1.4 Water Management: Interstate Compacts and International Treaties.....	4-49
22	4.9.2	Groundwater Resources.....	4-52
23	4.9.3	Water Rights, Supply, and Use.....	4-58
24		4.9.3.1 Arizona.....	4-64
25		4.9.3.2 California.....	4-66
26		4.9.3.3 Colorado.....	4-69
27		4.9.3.4 Nevada.....	4-72
28		4.9.3.5 New Mexico.....	4-74
29		4.9.3.6 Utah.....	4-76
30	4.10	Ecological Resources	4-79
31	4.10.1	Vegetation.....	4-79
32	4.10.2	Wildlife.....	4-80
33		4.10.2.1 Amphibians and Reptiles.....	4-82
34		4.10.2.2 Birds.....	4-82
35		4.10.2.3 Mammals.....	4-87
36	4.10.3	Aquatic Biota.....	4-91
37		4.10.3.1 Pacific Northwest Hydrologic Region.....	4-91
38		4.10.3.2 Lower Colorado, Rio Grande, and Great Basin Hydrologic Regions.....	4-92
40		4.10.3.3 California Hydrologic Region.....	4-94
41		4.10.3.4 Upper Colorado River Hydrologic Region.....	4-95
42		4.10.3.5 Missouri River Basin Hydrologic Region.....	4-96
43	4.10.4	Special Status Species.....	4-96
44	4.11	Air Quality and Climate	4-115
45	4.11.1	Meteorology.....	4-115
46		4.11.1.1 Arizona.....	4-115

CONTENTS (Cont.)

1
2
3
4 4.11.1.2 California 4-117
5 4.11.1.3 Colorado..... 4-117
6 4.11.1.4 Nevada 4-118
7 4.11.1.5 New Mexico..... 4-118
8 4.11.1.6 Utah..... 4-118
9 4.11.1.7 Overview across the Study Area..... 4-119
10 4.11.2 Existing Emissions and Air Quality..... 4-123
11 4.11.2.1 Existing Emissions..... 4-123
12 4.11.2.2 National Ambient Air Quality Standards..... 4-123
13 4.11.2.3 Prevention of Significant Deterioration 4-128
14 4.11.2.4 Visibility Protection 4-129
15 4.11.2.5 General Conformity 4-129
16 4.11.3 Greenhouse Gas Emissions and Climate Change 4-130
17 4.12 Visual Resources..... 4-132
18 4.12.1 Introduction..... 4-132
19 4.12.2 BLM Visual Resource Management in the Six-State Study Area... 4-134
20 4.13 Acoustic Environment 4-135
21 4.13.1 Noise 4-135
22 4.13.2 Vibration 4-139
23 4.14 Paleontological Resources 4-140
24 4.15 Cultural Resources..... 4-143
25 4.15.1 Archaeological and Historic Resources 4-162
26 4.15.2 *National Register of Historic Places* and
27 Congressionally Designated Properties 4-162
28 4.15.3 Traditional Cultural Properties 4-163
29 4.16 Native American Concerns 4-166
30 4.17 Socioeconomics 4-176
31 4.17.1 Employment..... 4-176
32 4.17.2 Unemployment..... 4-177
33 4.17.3 Personal Income..... 4-177
34 4.17.4 Sales Tax Revenues 4-178
35 4.17.5 Individual Income Tax Revenues 4-179
36 4.17.6 Population 4-179
37 4.17.7 Vacant Rental Housing 4-181
38 4.17.8 State and Local Government Expenditures 4-181
39 4.17.9 State and Local Government Employment..... 4-182
40 4.18 Environmental Justice..... 4-183
41 4.19 References..... 4-187
42
43 5 IMPACTS OF SOLAR ENERGY DEVELOPMENT AND POTENTIAL
44 MITIGATION MEASURES..... 5-1
45
46 5.1 Introduction..... 5-1

CONTENTS (Cont.)

1
2
3
4 [5.2 Lands and Realty](#)..... 5-2
5 5.2.1 Common Impacts..... 5-3
6 5.2.1.1 Construction and Operations 5-5
7 5.2.1.2 Transmission Lines and Roads 5-5
8 5.2.2 Technology-Specific Impacts 5-6
9 5.2.3 Potentially Applicable Mitigation Measures 5-6
10 [5.3 Specially Designated Areas and Lands with Wilderness Characteristics](#)..... 5-7
11 5.3.1 Common Impacts..... 5-8
12 5.3.2 Technology-Specific Impacts 5-9
13 5.3.3 Potentially Applicable Mitigation Measures 5-10
14 [5.4 Rangeland Resources](#)..... 5-10
15 5.4.1 Livestock Grazing..... 5-10
16 5.4.1.1 Common Impacts..... 5-10
17 5.4.1.2 Technology-Specific Impacts 5-11
18 5.4.1.3 Potentially Applicable Mitigation Measures 5-11
19 5.4.2 Wild Horses and Burros..... 5-12
20 5.4.2.1 Common Impacts..... 5-12
21 5.4.2.2 Technology-Specific Impacts 5-13
22 5.4.2.3 Potentially Applicable Mitigation Measures 5-13
23 5.4.3 Wildland Fire..... 5-13
24 5.4.3.1 Common Impacts..... 5-13
25 5.4.3.2 Technology-Specific Impacts 5-14
26 5.4.3.3 Potentially Applicable Mitigation Measures 5-15
27 [5.5 Recreation](#)..... 5-16
28 5.5.1 Common Impacts..... 5-16
29 5.5.1.1 Construction and Operations 5-16
30 5.5.1.2 Transmission Lines and Roads 5-17
31 5.5.2 Technology-Specific Impacts 5-17
32 5.5.3 Potentially Applicable Mitigation Measures 5-17
33 [5.6 Military and Civilian Aviation](#)..... 5-17
34 5.6.1 Common Impacts..... 5-17
35 5.6.2 Technology-Specific Impacts 5-18
36 5.6.3 Potentially Applicable Mitigation Measures 5-19
37 [5.7 Geologic Setting and Soil Resources](#)..... 5-19
38 5.7.1 Common Impacts..... 5-19
39 5.7.1.1 Site Characterization..... 5-24
40 5.7.1.2 Site Preparation and Construction 5-24
41 5.7.1.3 Operations..... 5-25
42 5.7.1.4 Decommissioning/Reclamation..... 5-25
43 5.7.1.5 Transmission Lines and Roads 5-26
44 5.7.2 Technology-Specific Impacts 5-27
45 5.7.3 Geologic Hazards..... 5-27
46 5.7.4 Potentially Applicable Mitigation Measures 5-29

CONTENTS (Cont.)

1
2
3
4 5.7.4.1 Soil Resources..... 5-29
5 5.7.4.2 Geologic Hazards..... 5-35
6 5.8 Minerals..... 5-35
7 5.8.1 Common Impacts..... 5-36
8 5.8.1.1 Construction and Operations 5-36
9 5.8.1.2 Transmission Lines and Roads 5-36
10 5.8.2 Technology-Specific Impacts 5-36
11 5.8.3 Potentially Applicable Mitigation Measures 5-36
12 5.9 Water Resources..... 5-37
13 5.9.1 Common Impacts..... 5-38
14 5.9.1.1 Site Characterization..... 5-38
15 5.9.1.2 Construction..... 5-38
16 5.9.1.3 Operations..... 5-41
17 5.9.1.4 Decommissioning/Reclamation 5-43
18 5.9.1.5 Transmission Lines 5-43
19 5.9.2 Technology-Specific Impacts 5-44
20 5.9.2.1 Parabolic Trough and Power Towers..... 5-44
21 5.9.2.2 Dish Engine..... 5-45
22 5.9.2.3 PV Systems..... 5-46
23 5.9.3 Potentially Applicable Mitigation Measures 5-46
24 5.9.3.1 Siting and Design..... 5-46
25 5.9.3.2 Site Characterization and Construction 5-51
26 5.9.3.3 Operations..... 5-54
27 5.9.3.4 Decommissioning/Reclamation 5-55
28 5.10 Ecological Resources..... 5-55
29 5.10.1 Vegetation..... 5-55
30 5.10.1.1 Common Impacts..... 5-55
31 5.10.1.2 Technology-Specific Impacts 5-72
32 5.10.2 Wildlife..... 5-73
33 5.10.2.1 Common Impacts..... 5-73
34 5.10.2.2 Technology-Specific Impacts 5-97
35 5.10.3 Aquatic Biota and Habitats 5-98
36 5.10.3.1 Common Impacts..... 5-98
37 5.10.3.2 Technology-Specific Impacts 5-107
38 5.10.4 Special Status Species..... 5-113
39 5.10.4.1 Common Impacts..... 5-113
40 5.10.4.2 Technology-Specific Impacts 5-125
41 5.10.5 Potentially Applicable Mitigation Measures 5-126
42 5.10.5.1 Siting and Design..... 5-126
43 5.10.5.2 General Multiphase Measures 5-129
44 5.10.5.3 Site Characterization..... 5-137
45 5.10.5.4 Construction..... 5-137
46 5.10.5.5 Operations..... 5-139

CONTENTS (Cont.)

1
2
3
4 5.10.5.6 Decommissioning/Reclamation 5-141
5 5.10.5.7 Transmission Lines and Roads 5-142
6 5.11 Air Quality and Climate..... 5-145
7 5.11.1 Common Impacts 5-145
8 5.11.1.1 Site Characterization..... 5-145
9 5.11.1.2 Construction..... 5-145
10 5.11.1.3 Operations 5-147
11 5.11.1.4 Decommissioning/Reclamation 5-148
12 5.11.1.5 Transmission Lines and Roads 5-148
13 5.11.2 Technology-Specific Impacts 5-149
14 5.11.2.1 Parabolic Trough and Power Tower 5-150
15 5.11.2.2 Dish Engine..... 5-151
16 5.11.2.3 PV Systems 5-151
17 5.11.2.4 Albedo Effects of Solar Technologies 5-152
18 5.11.3 Potentially Applicable Mitigation Measures 5-153
19 5.11.3.1 Siting and Design..... 5-153
20 5.11.3.2 General Multiphase Measures 5-154
21 5.11.3.3 Construction..... 5-155
22 5.11.3.4 Operations 5-156
23 5.11.3.5 Decommissioning/Reclamation 5-156
24 5.11.3.6 Transmission Lines and Roads 5-156
25 5.11.4 Impacts of Greenhouse Gas Emissions..... 5-157
26 5.12 Visual Resources..... 5-158
27 5.12.1 Common Impacts 5-166
28 5.12.1.1 Site Characterization..... 5-166
29 5.12.1.2 Construction..... 5-166
30 5.12.1.3 Operations 5-168
31 5.12.1.4 Decommissioning/Reclamation 5-172
32 5.12.1.5 Transmission Lines and Roads 5-173
33 5.12.2 Technology-Specific Impacts 5-175
34 5.12.2.1 Parabolic Trough..... 5-175
35 5.12.2.2 Compact Linear Fresnel Reflector 5-183
36 5.12.2.3 Power Tower..... 5-183
37 5.12.2.4 Dish Engine..... 5-187
38 5.12.2.5 PV Systems 5-189
39 5.12.3 Potentially Applicable Mitigation Measures 5-191
40 5.12.3.1 Siting and Design..... 5-192
41 5.12.3.2 Building and Structural Materials..... 5-197
42 5.12.3.3 General Multiphase Measures 5-199
43 5.12.3.4 Construction..... 5-199
44 5.12.3.5 Operations 5-201
45 5.12.3.6 Decommissioning/Reclamation 5-202
46 5.12.3.7 Use of Off-Site Mitigation Measures..... 5-203

CONTENTS (Cont.)

1
2
3
4 [5.13 Acoustic Environment](#) 5-204
5 5.13.1 Common Impacts 5-204
6 5.13.1.1 Site Characterization 5-204
7 5.13.1.2 Construction 5-205
8 5.13.1.3 Operations 5-206
9 5.13.1.4 Decommissioning/Reclamation 5-207
10 5.13.1.5 Transmission Lines and Roads 5-208
11 5.13.2 Technology-Specific Impacts 5-209
12 5.13.2.1 Parabolic Trough and Power Tower 5-210
13 5.13.2.2 Dish Engine 5-210
14 5.13.2.3 PV Systems 5-211
15 5.13.3 Potentially Applicable Mitigation Measures 5-212
16 5.13.3.1 Siting and Design 5-212
17 5.13.3.2 General Multiphase Measures 5-213
18 5.13.3.3 Construction and Decommissioning/Reclamation 5-213
19 5.13.3.4 Operations 5-214
20 5.13.3.5 Transmission Lines and Roads 5-214
21 [5.14 Paleontological Resources](#) 5-214
22 5.14.1 Common Impacts 5-215
23 5.14.2 Technology-Specific Impacts 5-216
24 5.14.3 Potentially Applicable Mitigation Measures 5-216
25 [5.15 Cultural Resources](#) 5-217
26 5.15.1 Common Impacts 5-218
27 5.15.2 Technology-Specific Impacts 5-219
28 5.15.3 Potentially Applicable Mitigation Measures 5-219
29 5.15.3.1 Siting and Design 5-221
30 5.15.3.2 Construction, Operation, and Decommissioning/
31 Reclamation 5-222
32 [5.16 Native American Concerns](#) 5-223
33 5.16.1 Common Impacts 5-223
34 5.16.2 Technology-Specific Impacts 5-224
35 5.16.3 Potentially Applicable Mitigation Measures 5-225
36 [5.17 Socioeconomics](#) 5-227
37 5.17.1 Common Impacts 5-228
38 5.17.1.1 Construction and Operations 5-228
39 5.17.1.2 Transmission Lines 5-232
40 5.17.2 Technology-Specific Impacts 5-235
41 5.17.2.1 Parabolic Trough 5-235
42 5.17.2.2 Power Tower 5-239
43 5.17.2.3 Dish Engine 5-242
44 5.17.2.4 PV Systems 5-245
45 5.17.3 Potentially Applicable Mitigation Measures 5-248
46 [5.18 Environmental Justice](#) 5-250

CONTENTS (Cont.)

1			
2			
3			
4	5.18.1	Common Impacts	5-250
5	5.18.2	Technology-Specific Impacts	5-251
6	5.18.3	Potentially Applicable Mitigation Measures	5-251
7	<u>5.19</u>	<u>Transportation</u>	5-253
8	5.19.1	Common Impacts	5-253
9		5.19.1.1 Siting	5-253
10		5.19.1.2 Site Construction	5-254
11		5.19.1.3 Operations	5-255
12		5.19.1.4 Decommissioning/Reclamation	5-256
13	5.19.2	Technology-Specific Impacts	5-256
14	5.19.3	Potentially Applicable Mitigation Measures	5-257
15	<u>5.20</u>	<u>Hazardous Materials and Waste</u>	5-258
16	5.20.1	Common Impacts	5-258
17		5.20.1.1 Construction	5-258
18		5.20.1.2 Operations	5-259
19		5.20.1.3 Decommissioning/Reclamation	5-260
20	5.20.2	Technology-Specific Impacts	5-261
21		5.20.2.1 Parabolic Trough and Power Tower	5-261
22		5.20.2.2 Dish Engine	5-262
23		5.20.2.3 PV Systems	5-263
24	5.20.3	Potentially Applicable Mitigation Measures	5-264
25	<u>5.21</u>	<u>Health and Safety</u>	5-268
26	5.21.1	Common Impacts	5-268
27		5.21.1.1 Occupational Health and Safety	5-268
28		5.21.1.2 Public Health and Safety	5-272
29	5.21.2	Technology-Specific Impacts	5-273
30		5.21.2.1 Parabolic Trough and Power Tower	5-273
31		5.21.2.2 Dish Engine	5-275
32		5.21.2.3 PV Systems	5-275
33	5.21.3	Potential Impacts of Accidents, Sabotage, and Terrorism	5-275
34		5.21.3.1 Regulatory Background	5-276
35		5.21.3.2 Credible Events	5-277
36	5.21.4	Potentially Applicable Mitigation Measures	5-278
37		5.21.4.1 Occupational Health and Safety	5-278
38		5.21.4.2 Public Health and Safety	5-280
39	<u>5.22</u>	<u>References</u>	5-282
40			
41	<u>6</u>	<u>ANALYSIS OF BLM’S SOLAR ENERGY DEVELOPMENT</u>	
42		<u>ALTERNATIVES</u>	6-1
43			
44	<u>6.1</u>	<u>Impacts of the Solar Energy Development Program Alternative</u>	6-31
45	6.1.1	Facilitate Near-Term Solar Energy Development	6-32
46	6.1.2	Minimize Environmental Impacts	6-34

CONTENTS (Cont.)

1			
2			
3			
4	6.1.3	Minimize Social and Economic Impacts	6-37
5	6.1.4	Provide Flexibility to Solar Industry	6-38
6	6.1.5	Optimize Existing Transmission Infrastructure and Corridors.....	6-39
7	6.1.6	Standardize and Streamline the Authorization Process	6-39
8	6.1.7	Meet Projected Demand for Solar Energy Development	6-39
9	<u>6.2</u>	<u>Impacts of the SEZ Program Alternative</u>	6-40
10	6.2.1	Facilitate Near-Term Solar Energy Development	6-41
11	6.2.2	Minimize Environmental Impacts	6-41
12	6.2.3	Minimize Social and Economic Impacts	6-42
13	6.2.4	Provide Flexibility to Solar Industry	6-43
14	6.2.5	Optimize Existing Transmission Infrastructure and Corridors.....	6-43
15	6.2.6	Standardize and Streamline the Authorization Process	6-44
16	6.2.7	Meet Projected Demand for Solar Energy Development	6-44
17	<u>6.3</u>	<u>Impacts of the No Action Alternative</u>	6-45
18	6.3.1	Facilitate Near-Term Solar Energy Development	6-45
19	6.3.2	Minimize Environmental Impacts	6-46
20	6.3.3	Minimize Social and Economic Impacts	6-47
21	6.3.4	Provide Flexibility to Solar Industry	6-47
22	6.3.5	Optimize Existing Transmission Infrastructure and Corridors.....	6-47
23	6.3.6	Standardize and Streamline the Authorization Process	6-48
24	6.3.7	Meet Projected Demand for Solar Energy Development	6-48
25	<u>6.4</u>	<u>Comparison of Alternatives and Selection of Preferred Alternative</u>	6-48
26	<u>6.5</u>	<u>Cumulative Impacts</u>	6-52
27	6.5.1	Overview of Activities in the Six-State Study Area.....	6-53
28	6.5.1.1	Energy Production and Distribution	6-58
29	6.5.1.1.1	Oil and Gas Production	6-58
30	6.5.1.1.2	Coal Production.....	6-61
31	6.5.1.1.3	Nuclear Electricity Generation.....	6-62
32	6.5.1.1.4	Renewable Energy Development.....	6-62
33	6.5.1.1.5	Transmission and Distribution Systems...	6-64
34	6.5.1.2	Other Activities and Trends.....	6-73
35	6.5.1.2.1	Other Activities	6-73
36	6.5.1.2.2	General Trends	6-82
37	6.5.2	Cumulative Impacts Assessment for Solar Energy Development ...	6-87
38	6.5.2.1	Lands and Realty	6-89
39	6.5.2.2	Specially Designated Areas and Lands	
40		with Wilderness Characteristics.....	6-90
41	6.5.2.3	Rangeland Resources	6-91
42	6.5.2.4	Recreation	6-91
43	6.5.2.5	Military and Civilian Aviation.....	6-92
44	6.5.2.6	Geologic Setting and Soil Resources.....	6-92
45	6.5.2.7	Mineral Resources	6-93
46	6.5.2.8	Water Resources	6-93

CONTENTS (Cont.)

1
2
3
4 6.5.2.9 Ecological Resources 6-94
5 6.5.2.9.1 Vegetation 6-94
6 6.5.2.9.2 Wildlife and Aquatic Biota 6-95
7 6.5.2.9.3 Special Status Species 6-96
8 6.5.2.10 Air Quality and Climate..... 6-96
9 6.5.2.10.1 Local and Regional Impacts..... 6-96
10 6.5.2.10.2 Global Climate Change..... 6-97
11 6.5.2.11 Visual Resources..... 6-98
12 6.5.2.12 Acoustic Environment 6-98
13 6.5.2.13 Paleontological Resources 6-99
14 6.5.2.14 Cultural Resources 6-99
15 6.5.2.15 Native American Concerns..... 6-100
16 6.5.2.16 Socioeconomics 6-100
17 6.5.2.17 Environmental Justice..... 6-101
18 6.5.2.18 Transportation..... 6-101
19 6.6 Other NEPA Considerations..... 6-102
20 6.6.1 Unavoidable Adverse Impacts 6-102
21 6.6.2 Short-Term Use of the Environment and Long-Term Productivity 6-102
22 6.6.3 Irreversible and Irrecoverable Commitment of Resources..... 6-103
23 6.6.4 Mitigation of Adverse Effects..... 6-104
24 6.7 References..... 6-105
25
26 7 ANALYSIS OF DOE’S ALTERNATIVES..... 7-1
27
28 7.1 Impacts of DOE’s Proposed Action..... 7-1
29 7.2 Impacts of the No Action Alternative..... 7-3
30 7.3 Cumulative Impacts 7-3
31 7.4 Other NEPA Considerations..... 7-5
32 7.4.1 Unavoidable Adverse Impacts 7-5
33 7.4.2 Short-Term Use of the Environment and Long-Term Productivity 7-5
34 7.4.3 Irreversible and Irrecoverable Commitment of Resources..... 7-6
35 7.4.4 Mitigation of Adverse Effects..... 7-7
36
37 14 CONSULTATION AND COORDINATION UNDERTAKEN
38 TO SUPPORT PREPARATION OF THE PEIS..... 14-1
39
40 14.1 Public Scoping 14-1
41 14.1.1 Initial PEIS Scoping..... 14-1
42 14.1.2 Solar Energy Study Areas Scoping..... 14-2
43 14.1.2.1 Arizona Study Areas 14-3
44 14.1.2.2 California Study Areas..... 14-3
45 14.1.2.3 Colorado Study Areas 14-4
46 14.1.2.4 Nevada Study Areas..... 14-4

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46

CONTENTS (Cont.)

14.1.2.5	New Mexico Study Areas	14-5
14.1.2.6	Utah Study Areas	14-6
14.2	Government-to-Government Consultation	14-6
14.3	Coordination of BLM State and Field Offices	14-7
14.4	Agency Cooperation, Consultation, and Coordination	14-8
14.5	References	14-9
15	LIST OF PREPARERS	15-1
16	GLOSSARY	16-1

FIGURES

ES.2-1	BLM-Administered Lands and Active Solar Facility ROW Applications in the Six-State Study Area	ES-4
ES.2-2	BLM-Administered Lands in Arizona Available for Application for Solar Energy ROW Authorizations under the BLM Alternatives Considered in This PEIS	ES-30
ES.2-3	BLM-Administered Lands in California Available for Application for Solar Energy ROW Authorizations under the BLM Alternatives Considered in This PEIS	ES-31
ES.2-4	BLM-Administered Lands in Colorado Available for Application for Solar Energy ROW Authorizations under the BLM Alternatives Considered in This PEIS	ES-32
ES.2-5	BLM-Administered Lands in Nevada Available for Application for Solar Energy ROW Authorizations under the BLM Alternatives Considered in This PEIS	ES-33
ES.2-6	BLM-Administered Lands in New Mexico Available for Application for Solar Energy ROW Authorizations under the BLM Alternatives Considered in This PEIS	ES-34
ES.2-7	BLM-Administered Lands in Utah Available for Application for Solar Energy ROW Authorizations under the BLM Alternatives Considered in This PEIS	ES-35

FIGURES (Cont.)

1			
2			
3			
4	1.2-1	Typical Solar Fields for Various Technology Types: Solar Parabolic Trough, Solar Power Tower, Dish Engine, and PV	1-5
5			
6			
7	1.2-2	Solar Direct Normal Insolation Levels in the Southwestern United States	1-6
8			
9			
10	1.3-1	BLM-Administered Lands and Active Solar Facility ROW Applications Lands in the Six-State Study Area.....	1-11
11			
12			
13	2.2-1	BLM-Administered Lands in Arizona Available for Application for Solar Energy ROW Authorizations under the BLM Alternatives Considered in This PEIS	2-30
14			
15			
16			
17	2.2-2	BLM-Administered Lands in California Available for Application for Solar Energy ROW Authorizations under the BLM Alternatives Considered in This PEIS	2-31
18			
19			
20			
21	2.2-3	BLM-Administered Lands in Colorado Available for Application for Solar Energy ROW Authorizations under the BLM Alternatives Considered in This PEIS	2-32
22			
23			
24			
25	2.2-4	BLM-Administered Lands in Nevada Available for Application for Solar Energy ROW Authorizations under the BLM Alternatives Considered in This PEIS	2-33
26			
27			
28			
29	2.2-5	BLM-Administered Lands in New Mexico Available for Application for Solar Energy ROW Authorizations under the BLM Alternatives Considered in This PEIS	2-34
30			
31			
32			
33	2.2-6	BLM-Administered Lands in Utah Available for Application for Solar Energy ROW Authorizations under the BLM Alternatives Considered in This PEIS	2-35
34			
35			
36			
37	3.1-1	Solar Field for the Florida Power and Light Parabolic Trough Facility Known as SEGS VI, Kramer Junction, California	3-2
38			
39			
40	3.1-2	Solar Two, CSP Power Tower Facility in Daggett, California.....	3-5
41			
42	3.1-3	Stirling Dish Engines at the Stirling Energy Systems Test Facility in Albuquerque, New Mexico.....	3-7
43			
44			
45	3.1-4	Utility-Scale Flat-Plate PV System at the Prescott, Arizona, Airport Operated by Arizona Public Service Company	3-9
46			

FIGURES (Cont.)

1			
2			
3			
4	4.3-1	Specially Designated Areas on Public Lands in Arizona	4-5
5			
6	4.3-2	Specially Designated Areas on Public Lands in Northern and Central California.....	4-6
7			
8			
9	4.3-3	Specially Designated Areas on Public Lands in Southern California.....	4-7
10			
11	4.3-4	Specially Designated Areas on Public Lands in Colorado	4-8
12			
13	4.3-5	Specially Designated Areas on Public Lands in Nevada	4-9
14			
15	4.3-6	Specially Designated Areas on Public Lands in New Mexico	4-10
16			
17	4.3-7	Specially Designated Areas on Public Lands in Utah	4-11
18			
19	4.6-1	Locations of Restricted Military Airspace over the Six-State Study Area	4-16
20			
21			
22	4.7-1	Physiographic Provinces of the Six-State Study Area.....	4-18
23			
24	4.7-2	Quaternary Faults in the Six-State Study Area	4-24
25			
26	4.7-3	Peak Horizontal Ground Acceleration within the Six-State Study Area with a 10% Probability of Exceedance in 50 Years	4-25
27			
28			
29	4.7-4	Active Volcanoes and Areas of Unrest Potentially Affecting the Six-State Study Area.....	4-27
30			
31			
32	4.7-5	Landslide Hazard Potential Map of the Six-State Study Area.....	4-30
33			
34	4.9-1	Hydrologic Regions in the Six-State Study Area	4-38
35			
36	4.9-2	Wild and Scenic River Segments within the Six-State Study Area.....	4-44
37			
38	4.9-3	Major Aquifer Systems in the Six-State Study Area	4-53
39			
40	4.10-1	North American Migration Flyways.....	4-83
41			
42	4.11-1	CSP Resources in Six Southwestern States	4-116
43			
44	4.11-2	PV Solar Resources in Six Southwestern States.....	4-116
45			
46			

FIGURES (Cont.)

1

2

3

4 4.11-3 Wind Roses for Selected Meteorological Stations in the Six-State
5 Study Area, 1990 to 1995 4-121

6

7 4.11-4 Nonattainment Areas for SO₂, CO, 8-Hour O₃, PM₁₀, and PM_{2.5}
8 in the Six-State Study Area..... 4-127

9

10 4.11-5 PSD Class I Areas in the Six-State Study Area 4-129

11

12 4.13-1 Day-Night Average Sound Level by County, Estimated on the
13 Basis of Population Density..... 4-139

14

15 4.15-1 Major Culture Areas, Congressionally Designated National
16 Historic Trails, and National Historic Landmarks within the
17 Six-State Study Area..... 4-163

18

19 5.10-1 BLM-Administered Lands with Potential for Solar Energy
20 Development and Associated Level III Ecoregions..... 5-64

21

22 5.12-1 Transmission Towers: Lattice and Monopole..... 5-175

23

24 5.12-2 Trough Collectors for the Parabolic Trough Facility, Kramer
25 Junction, California..... 5-177

26

27 5.12-3 Solar Field for Parabolic Trough Facility, Kramer Junction, California 5-177

28

29 5.12-4 Parabolic Trough Facility from an Elevated Viewpoint 5-178

30

31 5.12-5 Distant View of Parabolic Trough Facility 5-179

32

33 5.12-6 Glare from Parabolic Trough Facility at Distance of 2.0 mi 5-180

34

35 5.12-7 Visual Effects from Parabolic Trough Facility 5-181

36

37 5.12-8 Power Plant at Commercial-Scale Parabolic Trough Facility 5-182

38

39 5.12-9 Commercial CLFR Solar Array 5-183

40

41 5.12-10 Heliostats for a Solar Power Tower 5-184

42

43 5.12-11 Solucar Solar Power Tower and Heliostats, with Visible Dust
44 Particle “Tent” 5-185

45

46

FIGURES (Cont.)

1			
2			
3			
4	5.12-12	Solar Power Towers and Heliostats at the eSolar Sierra Suntower Facility in Lancaster, California	5-186
5			
6			
7	5.12-13	20-kW Solar Dish Engine Units in Alice Springs, Australia.....	5-188
8			
9	5.12-14	PV Panels, Nellis Air Force Base, Nevada.....	5-190
10			
11	5.12-15	PV Panels, Sacramento Municipal Utility District, Hedge Substation.....	5-190
12			
13	5.10-1	BLM-Administered Lands with Potential for Solar Energy Development and Associated Level III Ecoregions.....	5-64
14			
15			
16	5.12-1	Transmission Towers: Lattice and Monopole.....	5-175
17			
18	5.12-2	Trough Collectors for the Parabolic Trough Facility, Kramer Junction, California.....	5-177
19			
20			
21	5.12-3	Solar Field for Parabolic Trough Facility, Kramer Junction, California	5-177
22			
23	5.12-4	Parabolic Trough Facility from an Elevated Viewpoint.....	5-178
24			
25	5.12-5	Distant View of Parabolic Trough Facility.....	5-179
26			
27	5.12-6	Glare from Parabolic Trough Facility at Distance of 2.0 mi	5-180
28			
29	5.12-7	Visual Effects from Parabolic Trough Facility.....	5-181
30			
31	5.12-8	Power Plant at Commercial-Scale Parabolic Trough Facility	5-182
32			
33	5.12-9	Commercial CLFR Solar Array	5-183
34			
35	5.12-10	Heliostats for a Solar Power Tower.....	5-184
36			
37	5.12-11	Solucar Solar Power Tower and Heliostats, with Visible Dust Particle “Tent”	5-185
38			
39			
40	5.12-12	Solar Power Towers and Heliostats at the eSolar Sierra Suntower Facility in Lancaster, California	5-186
41			
42			
43	5.12-13	20-kW Solar Dish Engine Units in Alice Springs, Australia.....	5-188
44			
45	5.12-14	PV Panels, Nellis Air Force Base, Nevada.....	5-190
46			

FIGURES (Cont.)

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46

5.12-15	PV Panels, Sacramento Municipal Utility District, Hedge Substation.....	5-190
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TABLES

ES.2-1	Summary of Potentially Developable BLM-Administered Land under the No Action Alternative, the Solar Energy Development Program Alternative, and the SEZ Program Alternative	ES-6
ES.2-2	Areas for Exclusion under the BLM Solar Energy Development Program Alternative.....	ES-8
ES.2-3	Proposed SEZs and Approximate Acreage by State.....	ES-10
ES.2-4	Reasonably Foreseeable Development Scenario Projected Megawatts of Solar Power Development by 2030 and Corresponding Developed Acreage Estimates.....	ES-13
ES.2-5	Summary-Level Assessment of Potential Environmental Impacts by Alternative.....	ES-15
ES.2-6	Comparison of BLM’s Alternatives with Respect to Objectives for the Agency’s Action.....	ES-26
1.6-1	RPS Requirements and Other State Initiatives in the Six-State Study Area	1-22
2.2-1	Summary of Potentially Developable BLM-Administered Land under the No Action Alternative, the Solar Energy Development Program Alternative, and the SEZ Program Alternative	2-3
2.2-2	Areas for Exclusion under the BLM Solar Energy Development Program Alternative.....	2-8
2.2-3	Proposed SEZs and Approximate Acreage by State.....	2-12
2.2-4	BLM Field Offices with Lands Available for Solar Facility ROW Application under the Solar Energy Development Program and SEZ Program Alternatives	2-15
2.4-1	Projected Megawatts of Solar Power Development by 2030 and Corresponding Developed Acreage Estimates.....	2-20

TABLES (Cont.)

1			
2			
3			
4	2.4-2	Percentage of Available Lands Developed by the BLM Action	
5		Alternative Based on Estimated Acres Developed under the RFDS	2-22
6			
7	3.1-1	Technology-Specific Assumptions for Environmental Impact Analyses	3-11
8			
9	3.5-1	Hazardous Materials Used during Construction of Solar Energy Facilities ...	3-32
10			
11	3.5-2	Hazardous Materials Associated with the Operation of CSP Facilities.....	3-36
12			
13	3.5-3	Hazardous Materials Associated with the Operation of PV Facilities.....	3-40
14			
15	4.2-1	Acreage and Percentage of BLM-Administered Public Lands	
16		in the Six-State Study Area.....	4-3
17			
18	4.3-1	BLM National Landscape Conservation System Units in the Six-State	
19		Study Area	4-12
20			
21	4.4-1	Wild Horse and Burro Statistics for the Six-State Study Area, FY 2009	4-14
22			
23	4.7-1	Physiographic Provinces in the Six-State Study Area	4-19
24			
25	4.7-2	Relationship between Peak Horizontal Acceleration, Perceived Shaking,	
26		and Potential Structural Damage	4-26
27			
28	4.7-3	Areas of Subsidence in California, Nevada, Arizona, and New Mexico	
29		due to Groundwater Withdrawal.....	4-31
30			
31	4.7-4	Soil Orders in the Six-State Study Area in Order of Decreasing	
32		Predominance.....	4-33
33			
34	4.7-5	Wind Erodibility of Soils by Soil Texture	4-36
35			
36	4.8-1	Subsurface Mineral Lands under BLM-Administered Surface Lands	
37		within the Six-State Study Area.....	4-37
38			
39	4.9-1	Hydrologic Regions and Surface Water Conditions in the Six-State	
40		Study Area	4-40
41			
42	4.9-2	Designation Classification and Administrative Authority for Wild	
43		and Scenic Rivers in the Six-State Study Area.....	4-45
44			
45	4.9-3	Summary of Components to the Law of the River	4-51
46			

TABLES (Cont.)

1			
2			
3			
4	4.9-4	Characteristics of Major Aquifer Systems in the Six-State Study Area	4-55
5			
6	4.9-5	Sole Source Aquifers in the Six-State Study Area.....	4-58
7			
8	4.9-6	Water Withdrawal in Arizona by Sector, 2003.....	4-67
9			
10	4.9-7	Water Supplies for Applied Water in California, 1998, 2000, and 2001.....	4-68
11			
12	4.9-8	Water Use in California by Sector, 1998, 2000, and 2001	4-69
13			
14	4.9-9	Water Withdrawals in Colorado by Water Use Category, 2000.....	4-72
15			
16	4.9-10	Water Withdrawals in Nevada by Sector, 1995.....	4-74
17			
18	4.9-11	Water Withdrawals in New Mexico by Water Use Category, 2005.....	4-76
19			
20	4.9-12	Water Withdrawals in Utah by Water Use Category, 2000.....	4-78
21			
22	4.10-1	Wetland Areas in the Six-State Study Area, 1980s Estimates.....	4-80
23			
24	4.10-2	Number of Wildlife Species in the Six-State Study Area.....	4-81
25			
26	4.10-3	State Conservation Status Ranks for Big Game Species in the	
27		Six-State Study Area.....	4-88
28			
29	4.10-4	Species That Occur in the Six-State Study Area That Are Listed,	
30		Proposed for Listing, or Candidates for Listing under the ESA	4-97
31			
32	4.11-1	Temperature and Precipitation Summaries at Selected Meteorological	
33		Stations in the Six-State Study Area.....	4-120
34			
35	4.11-2	Number of Tornadoes by Fujita Tornado Scale in the Six-State Study	
36		Area for the Period of January 1, 1950 to June 30, 2008.....	4-122
37			
38	4.11-3	Statewide Criteria Pollutant and VOC Emissions for 2002 and	
39		Carbon Dioxide Emissions for 2005.....	4-124
40			
41	4.11-4	National Ambient Air Quality Standards and State Ambient Air	
42		Quality Standards for Criteria Pollutants in the Six-State Study Area	4-125
43			
44	4.11-5	Federal PSD Increments	4-128
45			
46			

TABLES (Cont.)

1			
2			
3			
4	4.12-1	Summary of Selected Potentially Sensitive Visual Resource Areas within the Six-State Study Area.....	4-136
5			
6			
7	4.13-1	Colorado Limits on Maximum Permissible Noise Levels	4-138
8			
9	4.14-1	ACECs Designated for Protection of Paleontological Resource Values That Are near BLM-Administered Lands Suitable for Solar Energy Development	4-142
10			
11			
12			
13	4.14-2	Age of Geologic Units and Potential Fossil Yield.....	4-145
14			
15	4.15-1	Cultural Resource Laws and Regulations	4-151
16			
17	4.15-2	BLM Guidance Regarding Cultural Resource Management	4-153
18			
19	4.15-3	ACECs Designated for Protection of Cultural Resource Values That Are near BLM-Administered Lands Suitable for Solar Energy Development	4-154
20			
21			
22			
23	4.15-4	Time Periods and Examples of Characteristic Cultural Resources for Culture Areas in the Six-State Study Area.....	4-164
24			
25			
26	4.15-5	Major Culture Areas and Historic Period Site Types Listed by State	4-165
27			
28	4.15-6	Reportable Inventory Data for BLM-Administered Lands.....	4-166
29			
30	4.15-7	BLM Properties Determined Eligible for the NRHP in the Six-State Study Area	4-166
31			
32			
33	4.15-8	National Historic Landmarks within 25 mi of BLM-Administered Lands Suitable for Solar Energy Development in the Six-State Study Area	4-167
34			
35			
36	4.15-9	Congressionally Designated National Historic Trails within the Six-State Study Area.....	4-168
37			
38			
39	4.16-1	Tribes Whose Traditional Tribal Use Area Includes BLM-Administered Lands Being Analyzed for Solar Development	4-169
40			
41			
42	4.16-2	Tribes Contacted for this PEIS with Traditional Territory in Solar-Suitable Areas	4-170
43			
44			
45	4.16-3	Resources Important to Tribes	4-174
46			

TABLES (Cont.)

1

2

3

4 4.16-4 Natural Resources Traditionally Widely Used by Native Americans

5 in the Arid Southwest..... 4-175

6

7 4.17-1 State Employment..... 4-177

8

9 4.17-2 Unemployment Data 4-178

10

11 4.17-3 State Personal Income..... 4-178

12

13 4.17-4 State Sales Taxes..... 4-179

14

15 4.17-5 State Individual Income Taxes..... 4-180

16

17 4.17-6 State Population 4-180

18

19 4.17-7 Vacant Rental Housing Units..... 4-181

20

21 4.17-8 Total State and Local Government Expenditures 4-182

22

23 4.17-9 Total State and Local Government Employment..... 4-183

24

25 4.18-1 State Minority and Low-Income Populations for the Six-State

26 Study Area 4-186

27

28 5.1-1 Mitigation Plans to Minimize Environmental Impacts of Utility-Scale

29 Solar Energy Facilities 5-3

30

31 5.7-1 Potential Impacts on Soil Resources Common to All Solar Energy

32 Projects..... 5-20

33

34 5.9-1 Estimates of Water Requirements for Various Solar Power Plant

35 Configurations..... 5-45

36

37 5.10-1 Potential Impacts on Plant Communities Associated with Utility-

38 Scale Solar Energy Facilities, Including Associated Access Roads

39 and Transmission Line Corridors..... 5-56

40

41 5.10-2 Potential Impacts on Wildlife Species Associated with Utility-Scale

42 Solar Energy Facilities, Including Associated Access Roads and

43 Transmission Line Corridors 5-90

44

45

TABLES (Cont.)

1

2

3

4 5.10-3 Potential Impacts on Aquatic Resources Associated with Utility-Scale
5 Solar Energy Facilities, Including Associated Access Roads and
6 Transmission Line Corridors 5-108
7

8 5.10-4 Potential Impacts on Special Status Species Associated with
9 Utility-Scale Solar Energy Facilities, Including Associated Access
10 Roads and Transmission Line Corridors..... 5-116
11

12 5.11-1 Annual per MWhr Emissions from Combustion-Related Power
13 Generation..... 5-150
14

15 5.17-1 Estimates of State Economic Impacts of Assumed Reductions
16 in Recreation Sector Activity..... 5-229
17

18 5.17-2 Socioeconomic Impacts of Construction and Operations of 25-mi
19 Transmission Lines 5-233
20

21 5.17-3 Socioeconomic Impacts of Construction and Operations
22 of Parabolic Trough Facilities..... 5-236
23

24 5.17-4 Socioeconomic Impacts of Construction and Operations
25 of Power Tower Facilities 5-240
26

27 5.17-5 Socioeconomic Impacts of Construction and Operations of Dish
28 Engine Facilities..... 5-243
29

30 5.17-6 Socioeconomic Impacts of Construction and Operations
31 of PV Facilities 5-246
32

33 5.21-1 Occupational Health and Safety Hazards of Solar Energy Facilities
34 and Associated Transmission Lines 5-269
35

36 5.21-2 Estimates of Annual Fatalities and Injuries for Construction and
37 Operation of Solar Power Facilities 5-271
38

39 6.1-1 Summary of Potentially Developable BLM-Administered Land
40 under the No Action Alternative, the Solar Energy Development
41 Program Alternative, and the SEZ Program Alternative 6-2
42

43 6.1-2 Summary-Level Assessment of Potential Environmental Impacts
44 by Alternative..... 6-4
45
46

TABLES (Cont.)

1			
2			
3			
4	6.1-3	Potential Effects of Environmental Impact Considerations on Acres Available for Solar Energy Development in the Proposed SEZs	6-15
5			
6			
7	6.1-4	Percentage of Available Lands Developed by BLM Action Alternatives Based on Estimated Acres Developed under RFDS	6-40
8			
9			
10	6.4-1	Comparison of BLM’s Alternatives with Respect to Objectives for the Agency’s Action	6-49
11			
12			
13	6.5-1	Types of Actions in the Six-State Study Area	6-54
14			
15	6.5-2	General Trends in the Six-State Study Area	6-58
16			
17	6.5-3	Programmatic-Level Actions on Federal Land.....	6-59
18			
19	6.5-4	Trends in Oil and Gas Production in the Six-State Study Area.....	6-60
20			
21	6.5-5	Oil and Gas Activities on Public Lands of the United States in FY 2009	6-60
22			
23	6.5-6	Coal Production in the Producing States within the Six-State Study Area in 2002 and 2008.....	6-61
24			
25			
26	6.5-7	Competitive and Noncompetitive Geothermal Leases on BLM Public Lands in FY 2002 and FY 2009.....	6-63
27			
28			
29	6.5-8	Number of Existing Oil and Gas Pipeline and Transmission Line ROWs on BLM Public Lands in FY 2002 and FY 2009.....	6-65
30			
31			
32	6.5-9	Planned Transmission Projects, Including Expansions, in the Six-State Study Area	6-66
33			
34			
35	6.5-10	Recreation Visits for the BLM, USFS, and NPS in FY 2000 and FY 2005.....	6-74
36			
37			
38	6.5-11	Solid Mineral Leases on BLM Public Lands in FY 2002 and FY 2009.....	6-76
39			
40	6.5-12	Number and Acreage of DoD Facilities by Military Service in the Six-State Study Area in FY 2007.....	6-77
41			
42			
43	6.5-13	Grazing Land in the Six-State Study Area, 2002.....	6-78
44			
45	6.5-14	Grazing Permits and Leases and AUMs on BLM Public Lands in FY 2002 and FY 2009.....	6-79
46			

TABLES (Cont.)

1
2
3
4 6.5-15 Forest Land in the Six-State Study Area by Major Class, FY 2002..... 6-80
5
6 6.5-16 Population Change in the Six-State Study Area and the United States
7 from 2000 to 2009..... 6-83
8
9 6.5-17 Rural and Urban Populations in the Six-State Study Area and the
10 United States from 1990 to 2000 6-83
11
12 6.5-18 Total Energy Consumption, Population, and Carbon Dioxide Emissions
13 for the United States and the Western Region, 2008 to 2030..... 6-85
14
15 6.5-19 Total Electric Power Generation for the United States and the Western
16 Region, 2006 to 2030..... 6-86
17
18 6.5-20 Total Water Withdrawals by Source, 2005..... 6-87
19
20 6.5-21 Total Water Withdrawals by Water-Use Category in 2000 and 2005 6-88
21
22 6.5-22 Comparison of CO₂ Emissions from Different Generation Methods
23 per Average Megawatt..... 6-97

NOTATION

The following is a list of acronyms and abbreviations, chemical names, and units of measure used in this document. Some acronyms used only in tables may be defined only in those tables.

GENERAL ACRONYMS AND ABBREVIATIONS

AADT	annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
AC	alternating current
ACC	air-cooled condenser
ACEC	Area of Critical Environmental Concern
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AERMOD	AMS/EPA Regulatory Model
AFC	Application for Certification
AGL	above ground level
AIRFA	American Indian Religious Freedom Act
AMA	active management area
AML	animal management level
ANHP	Arizona National Heritage Program
APE	area of potential effect
APLIC	Avian Power Line Interaction Committee
APP	Avian Protection Plan
AQCR	Air Quality Control Region
AQRV	air quality-related value
ARB	Air Resources Board
ARRA	American Recovery and Reinvestment Act of 2009
ARRTIS	Arizona Renewable Resource and Transmission Identification Subcommittee
ARS	Agricultural Research Service
ARZC	Arizona and California
ATSDR	Agency for Toxic Substances and Disease Registry
AUM	animal unit month
AVWS	Audio Visual Warning System
AWBA	Arizona Water Banking Authority
AWEA	American Wind Energy Association
AWRM	Active Water Resource Management
AZ DOT	Arizona Department of Transportation
AZDA	Arizona Department of Agriculture
AZGFD	Arizona Game and Fish Department
AZGS	Arizona Geological Survey

1	BA	biological assessment
2	BAP	base annual production
3	BEA	Bureau of Economic Analysis
4	BISON-M	Biota Information System of New Mexico
5	BLM	Bureau of Land Management
6	BMP	best management practice
7	BNSF	Burlington Northern Santa Fe
8	BO	biological opinion
9	BOR	U.S. Bureau of Reclamation
10	BPA	Bonneville Power Administration
11	BRAC	Blue Ribbon Advisory Council on Climate Change
12	BSE	Beacon Solar Energy
13	BSEP	Beacon Solar Energy Project
14	BTS	Bureau of Transportation Statistics
15		
16	CAA	Clean Air Act
17	CAAQS	California Air Quality Standards
18	Caltrans	California Department of Transportation
19	C-AMA	California-Arizona Maneuver Area
20	CAP	Central Arizona Project
21	CARB	California Air Resources Board
22	CAReGAP	California Regional Gap Analysis Project
23	CASQA	California Stormwater Quality Association
24	CASTNET	Clean Air Status and Trends NETwork
25	CAWA	Colorado Agricultural Water Alliance
26	CCC	Civilian Conservation Corps
27	CDC	Centers for Disease Control and Prevention
28	CDCA	California Desert Conservation Area
29	CDFG	California Department of Fish and Game
30	CDOT	Colorado Department of Transportation
31	CDOW	Colorado Division of Wildlife
32	CDPHE	Colorado Department of Public Health and Environment
33	CDWR	California Department of Water Resources
34	CEC	California Energy Commission
35	CEQ	Council on Environmental Quality
36	CES	constant elasticity of substitution
37	CESA	California Endangered Species Act
38	CESF	Carrizo Energy Solar Farm
39	CFR	<i>Code of Federal Regulations</i>
40	CGE	computable general equilibrium
41	CIRA	Cooperative Institute for Research in the Atmosphere
42	CLFR	compact linear Fresnel collector
43	CPC	Center for Plant Conservation
44	CNDDDB	California Natural Diversity Database
45	CNEL	community noise equivalent level
46	CNHP	Colorado National Heritage Program

1	Colorado DWR	Colorado Department of Water Resources
2	CPUC	California Public Utilities Commission
3	CPV	concentrating photovoltaic
4	CRBSCF	Colorado River Basin Salinity Control Forum
5	CREZ	competitive renewable energy zone
6	CRSCP	Colorado River Salinity Control Program
7	CSA	Candidate Study Area
8	CSC	Coastal Services Center
9	CSFG	carbon-sequestration fossil generation
10	CSP	concentrating solar power
11	CSQA	California Stormwater Quality Association
12	CSRI	Cultural Systems Research, Incorporated
13	CTG	combustion turbine generator
14	CTPG	California Transmission Planning Group
15	CTSR	Cumbres & Toltec Scenic Railroad
16	CUP	Conditional Use Permit
17	CVP	Central Valley Project
18	CWA	Clean Water Act
19	CWCB	Colorado Water Conservation Board
20	CWHR	California Wildlife Habitat Relationship System
21		
22	DC	direct current
23	DHS	U.S. Department of Homeland Security
24	DNA	Determination of NEPA Adequacy
25	DNI	direct normal insulation
26	DNL	day-night average sound level
27	DoD	U.S. Department of Defense
28	DOE	U.S. Department of Energy
29	DOI	U.S. Department of the Interior
30	DOL	U.S. Department of Labor
31	DOT	U.S. Department of Transportation
32	DRECP	California Desert Renewable Energy Conservation Plan
33	DSM	demand side management
34	DTC/C-AMA	Desert Training Center/California–Arizona Maneuver Area
35	DWMA	Desert Wildlife Management Area
36		
37	EA	environmental assessment
38	ECAR	East Central Area Reliability Coordination Agreement
39	ECOS	Environmental Conservation Online System (USFWS)
40	EERE	Energy Efficiency and Renewable Energy (DOE)
41	Eg	band gap energy
42	EIA	Energy Information Administration
43	EIS	environmental impact statement
44	EISA	Energy Independence and Security Act of 2007
45	EMF	electromagnetic field
46	E.O.	Executive Order

1	EPA	U.S. Environmental Protection Agency
2	EPRI	Electric Power Research Institute
3	EQIP	Environmental Quality Incentives Program
4	ERCOT	Electric Reliability Council of Texas
5	ERO	Electric Reliability Organization
6	ERS	Economic Research Service
7	ESA	Endangered Species Act of 1973
8	ESRI	Environmental Systems Research Institute
9		
10	FAA	Federal Aviation Administration
11	FBI	Federal Bureau of Investigation
12	FEMA	Federal Emergency Management Agency
13	FERC	Federal Energy Regulatory Commission
14	FHWA	Federal Highway Administration
15	FIRM	Flood Insurance Rate Map
16	FLPMA	Federal Land Policy and Management Act of 1976
17	FONSI	Finding of No Significant Impact
18	FR	<i>Federal Register</i>
19	FRCC	Florida Reliability Coordinating Council
20	FSA	Final Staff Assessment
21	FTE	full-time equivalent
22	FY	fiscal year
23		
24	G&TM	Generation and Transmission Modeling
25	GCRP	U.S. Global Climate Research Program
26	GDA	generation development area
27	GHG	greenhouse gas
28	GIS	geographic information system
29	GPS	global positioning system
30	GTM	Generation and Transmission Model
31	GUAC	Groundwater Users Advisory Council
32	GWP	global warming potential
33		
34	HA	herd area
35	HAP	hazardous air pollutant
36	HAZCOM	hazard communication
37	HCE	heat collection element
38	HCP	Habitat Conservation Plan
39	HMA	Herd Management Area
40	HMMH	Harris Miller Miller & Hanson, Inc.
41	HRSG	heat recovery steam generator
42	HSPD	Homeland Security Presidential Directive
43	HTF	heat transfer fluid
44	HVAC	heating, ventilation, and air-conditioning
45		
46		

1	I	Interstate
2	IARC	International Agency for Research on Cancer
3	IBA	important bird area
4	ICE	internal combustion engine
5	ICWMA	Imperial County Weed Management Area
6	IEC	International Electrochemical Commission
7	IFR	instrument flight rule
8	IID	Imperial Irrigation District
9	IM	Instruction Memorandum
10	IMPS	Iron Mountain Pumping Station
11	IMS	interim mitigation strategy
12	INA	Irrigation Non-Expansion Area
13	IOP	Interagency Operating Procedure
14	IOU	investor-owned utility
15	IPPC	Intergovernmental Panel on Climate Change
16	ISA	Independent Science Advisor; Instant Study Area
17	ISB	Intermontane Seismic Belt
18	ISCC	integrated solar combined cycle
19	ISDRA	Imperial Sand Dunes Recreation Area
20	ISEGS	Ivanpah Solar Energy Generating System
21	ITP	incidental take permit
22	IUCNNR	International Union for Conservation of Nature and Natural Resources
23	IUCNP	International Union for Conservation of Nature Pakistan
24		
25	KGA	known geothermal resources area
26	KML	keyhole markup language
27	KOP	key observation point
28	KSLA	known sodium leasing area
29		
30	LCC	Landscape Conservation Cooperative
31	LCOE	levelized cost of energy
32	L _{dn}	day-night average sound level
33	LDWMA	Low Desert Weed Management Area
34	L _{eq}	equivalent sound pressure level
35	LLA	limited land available
36	LLRW	low-level radioactive waste (waste classification)
37	LRG	Lower Rio Grande
38	LSA	lake and streambed alteration
39	LSE	load-serving entity
40	LTVA	long-term visitor area
41		
42	MAAC	Mid-Atlantic Area Council
43	MAIN	Mid-Atlantic Interconnected Network
44	MAPP	methyl acetylene propadiene stabilizer; Mid-Continent Area Power Pool
45	MCAS	Marine Corps Air Station
46	MCL	maximum contaminant level

1	MFP	Management Framework Plan
2	MIG	Minnesota IMPLAN Group
3	MLA	maximum land available
4	MOA	military operating area
5	MOU	Memorandum of Understanding
6	MPDS	maximum potential development scenario
7	MRA	Multiple Resource Area
8	MRI	Midwest Research Institute
9	MRO	Midwest Reliability Organization
10	MSDS	Material Safety Data Sheet
11	MSL	mean sea level
12	MTR	military training route
13	MWA	Mojave Water Agency
14	MWD	Metropolitan Water District
15	MWMA	Mojave Weed Management Area
16		
17	NAAQS	National Ambient Air Quality Standards
18	NADP	National Atmospheric Deposition Program
19	NAGPRA	Native American Graves Protection and Repatriation Act
20	NAHC	Native American Heritage Commission (California)
21	NAIC	North American Industrial Classification System
22	NASA	National Aeronautics and Space Administration
23	NCA	National Conservation Area
24	NCCAC	Nevada Climate Change Advisory Committee
25	NCDC	National Climatic Data Center
26	NCES	National Center for Education Statistics
27	NDCNR	Nevada Department of Conservation and Natural Resources
28	NDEP	Nevada Division of Environmental Protection
29	NDOT	Nevada Department of Transportation
30	NDOW	Nevada Department of Wildlife
31	NDWP	Nevada Division of Water Planning
32	NDWR	Nevada Division of Water Resources
33	NEAP	Natural Events Action Plan
34	NEC	National Electric Code
35	NED	National Elevation Database
36	NEP	Natural Events Policy
37	NEPA	National Environmental Policy Act of 1969
38	NERC	North American Electricity Reliability Corporation
39	NHA	National Heritage Area
40	NHNM	National Heritage New Mexico
41	NHPA	National Historic Preservation Act of 1966
42	NID	National Inventory of Dams
43	NM DOT	New Mexico Department of Transportation
44	NLCS	National Landscape Conservation System
45	NMAC	<i>New Mexico Administrative Code</i>
46	NMBGMR	New Mexico Bureau of Geology and Mineral Resources

1	NMDGF	New Mexico Department of Game and Fish
2	NMED	New Mexico Environment Department
3	NMED-AQB	New Mexico Environment Department-Air Quality Board
4	NMFS	National Marine Fisheries Service
5	NMOSE	New Mexico Office of the State Engineer
6	NMSU	New Mexico State University
7	NNHP	Nevada Natural Heritage Program
8	NNL	National Natural Landmark
9	NNSA	National Nuclear Security Administration
10	NOA	Notice of Availability
11	NOAA	National Oceanic and Atmospheric Administration
12	NOI	Notice of Intent
13	NPDES	National Pollutant Discharge Elimination System
14	NP	National Park
15	NPL	National Priorities List
16	NPS	National Park Service
17	NRA	National Recreation Area
18	NRCS	Natural Resources Conservation Service
19	NREL	National Renewable Energy Laboratory
20	NRHP	<i>National Register of Historic Places</i>
21	NRS	<i>Nevada Revised Statutes</i>
22	NSC	National Safety Council
23	NSO	no surface occupancy
24	NSTC	National Science and Technology Council
25	NTS	Nevada Test Site
26	NTTR	Nevada Test and Training Range
27	NVCRS	Nevada Cultural Resources Inventory System
28	NV DOT	Nevada Department of Transportation
29	NWCC	National Wind Coordinating Committee
30	NWI	National Wetlands Inventory
31	NWPP	Northwest Power Pool
32	NWR	National Wildlife Refuge
33	NWSRS	National Scenic River System
34		
35	O&M	operation and maintenance
36	ODFW	Oregon Department of Fish and Wildlife
37	OHV	off-highway vehicle
38	ONA	Outstanding Natural Area
39	ORC	organic Rankine cycle
40	OSE/ISC	Office of the State Engineer/Interstate Stream Commission
41	OSHA	Occupational Safety and Health Administration
42	OTA	Office of Technology Assessment
43		
44	PA	Programmatic Agreement
45	PAD	Preliminary Application Document
46	PAH	polycyclic aromatic hydrocarbon

1	PAT	peer analysis tool
2	PCB	polychlorinated biphenyl
3	PCM	purchase change material
4	PCS	power conditioning system
5	PCU	power converting unit
6	PEIS	programmatic environmental impact statement
7	PFYC	potential fossil yield classification
8	PIER	Public Interest Energy Research
9	P.L.	Public Law
10	PLSS	Public Land Survey System
11	PM	particulate matter
12	PM _{2.5}	particulate matter with a mean aerodynamic diameter of 2.5 µm or less
13	PM ₁₀	particulate matter with a mean aerodynamic diameter of 10 µm or less
14	POD	plan of development
15	POU	publicly owned utility
16	PPA	Power Purchase Agreement
17	PPE	personal protective equipment
18	PSD	Prevention of Significant Deterioration
19	PURPA	Public Utility Regulatory Policy Act
20	PV	photovoltaic
21	PVID	Palo Verde Irrigation District
22	PWR	public water reserve
23		
24	QRA	qualified resource area
25		
26	R&I	relevance and importance
27	RCI	residential, commercial, and industrial (sector)
28	RCRA	Resource Conservation and Recovery Act of 1976
29	RD&D	research, development, and demonstration; research, development, and
30		deployment
31	RDBMS	Relational Database Management System
32	RDEP	Restoration Design Energy Project
33	REA	Rapid Ecoregional Assessment
34	REAT	Renewable Energy Action Team
35	REDI	Renewable Energy Development Infrastructure
36	ReEDS	Regional Energy Deployment System
37	REPG	Renewable Energy Policy Group
38	RETA	Renewable Energy Transmission Authority
39	RETAAC	Renewable Energy Transmission Access Advisory Committee
40	RETI	Renewable Energy Transmission Initiative
41	REZ	renewable energy zone
42	RF	radio frequency
43	RFC	Reliability First Corporation
44	RFDS	reasonably foreseeable development scenario
45	RGP	Rio Grande Project
46	RGWCD	Rio Grande Water Conservation District

1	RMP	Resource Management Plan
2	RMPA	Rocky Mountain Power Area
3	RMZ	Resource Management Zone
4	ROD	Record of Decision
5	ROI	region of influence
6	ROS	recreation opportunity spectrum
7	ROW	right-of-way
8	RPG	renewable portfolio goal
9	RPS	Renewable Portfolio Standard
10	RRC	Regional Reliability Council
11	RSEP	Rice Solar Energy Project
12	RSI	Renewable Systems Interconnection
13	RTTF	Renewable Transmission Task Force
14	RV	recreational vehicle
15		
16	SAAQS	State Ambient Air Quality Standards
17	SAMHSA	Substance Abuse and Mental Health Services Administration
18	SCADA	supervisory control and data acquisition
19	SCE	Southern California Edison
20	SCRMA	Special Cultural Resource Management Area
21	SDRREG	San Diego Regional Renewable Energy Group
22	SDWA	Safe Drinking Water Act of 1974
23	SEGIS	Solar Energy Grid Integration System
24	SEGS	Solar Energy Generating System
25	SEI	Sustainable Energy Ireland
26	SEIA	Solar Energy Industrial Association
27	SES	Stirling Energy Systems
28	SETP	Solar Energy Technologies Program (DOE)
29	SEZ	solar energy zone
30	SHPO	State Historic Preservation Office(r)
31	SIP	State Implementation Plan
32	SLRG	San Luis & Rio Grande
33	SMA	Special Management Area
34	SMP	suggested management practice
35	SNWA	Southern Nevada Water Authority
36	SPP	Southwest Power Pool
37	SRMA	Special Recreation Management Area
38	SSA	Socorro Seismic Anomaly
39	SSI	self-supplied industry
40	ST	solar thermal
41	STG	steam turbine generator
42	SUA	special use airspace
43	SWAT	Southwest Area Transmission
44	SWIP	Southwest Intertie Project
45	SWPPP	Stormwater Pollution Prevention Plan
46	SWReGAP	Southwest Regional Gap Analysis Project
47		

1	TAP	toxic air pollutant
2	TCC	Transmission Corridor Committee
3	TDS	total dissolved solids
4	TEPPC	Transmission Expansion Planning Policy Committee
5	TES	thermal energy storage
6	TSA	Transportation Security Administration
7	TSCA	Toxic Substances Control Act of 1976
8	TSDF	treatment, storage, and disposal facility
9	TSP	total suspended particulates
10		
11	UACD	Utah Association of Conservation Districts
12	UBWR	Utah Board of Water Resources
13	UDA	Utah Department of Agriculture
14	UDEQ	Utah Department of Environmental Quality
15	UDNR	Utah Department of Natural Resources
16	UDOT	Utah Department of Transportation
17	UDWQ	Utah Division of Water Quality
18	UDWR	Utah Division of Wildlife Resources
19	UGS	Utah Geological Survey
20	UNEP	United Nations Environmental Programme
21	UNPS	Utah Native Plant Society
22	UP	Union Pacific
23	UREZ	Utah Renewable Energy Zone
24	USACE	U.S. Army Corps of Engineers
25	USC	<i>United States Code</i>
26	USDA	U.S. Department of Agriculture
27	USFS	U.S. Forest Service
28	USFWS	U.S. Fish and Wildlife Service
29	USGS	U.S. Geological Survey
30	Utah DWR	Utah Division of Water Rights
31	UTTR	Utah Test and Training Range
32	UWS	Underground Water Storage, Savings and Replenishment Act
33		
34	VACAR	Virginia-Carolinas Subregion
35	VCRS	Visual Contrast Rating System
36	VFR	visual flight rule
37	VOC	volatile organic compound
38	VRI	Visual Resource Inventory
39	VRM	Visual Resource Management
40		
41	WA	Wilderness Area
42	WAPA	Western Area Power Administration
43	WECC	Western Electricity Coordinating Council
44	WECC CAN	Western Electricity Coordinating Council – Canada
45	WEG	wind erodibility group
46	WGA	Western Governors’ Association

1	WGFD	Wyoming Game and Fish Department
2	WHA	wildlife habitat area
3	WHO	World Health Organization
4	WRAP	Water Resources Allocation Program; Western Regional Air Partnership
5	WRCC	Western Regional Climate Center
6	WREZ	Western Renewable Energy Zones
7	WRI	Water Resources Research Institute
8	WSA	Wilderness Study Area
9	WSC	wildlife species of special concern
10	WSMR	White Sands Missile Range
11	WSR	Wild and Scenic River
12	WSRA	Wild and Scenic Rivers Act of 1968
13	WWII	World War II
14		
15	YPG	Yuma Proving Ground
16		
17	ZITA	zone identification and technical analysis
18	ZLD	zero liquid discharge
19		
20		

21 **CHEMICALS**

23	CH ₄	methane	NO ₂	nitrogen dioxide
24	CO	carbon monoxide	NO _x	nitrogen oxides
25	CO ₂	carbon dioxide		
26	CO _{2e}	carbon dioxide equivalent	O ₃	ozone
27				
28	H ₂ S	hydrogen sulfide	Pb	lead
29	Hg	mercury		
30			SF ₆	sulfur hexafluoride
31	N ₂ O	nitrous oxide	SO ₂	sulfur dioxide
32	NH ₃	ammonia	SO _x	sulfur oxides
33				

35 **UNITS OF MEASURE**

37	ac-ft	acre-foot (feet)	°F	degree(s) Fahrenheit
38	bhp	brake horsepower	ft	foot (feet)
39			ft ²	square foot (feet)
40	°C	degree(s) Celsius	ft ³	cubic foot (feet)
41	cf	cubic foot (feet)		
42	cfs	cubic foot (feet) per second	g	gram(s)
43	cm	centimeter(s)	gal	gallon(s)
44			GJ	gigajoule(s)
45	dB	decibel(s)	gpcd	gallon per capita per day
46	dBA	A-weighted decibel(s)	gpd	gallon(s) per day

1	gpm	gallon(s) per minute	Mgal	million gallons
2	GW	gigawatt(s)	mi	mile(s)
3	GWh	gigawatt hour(s)	mi ²	square mile(s)
4	GWh/yr	gigawatt hour(s) per year	min	minute(s)
5			mm	millimeter(s)
6	h	hour(s)	MMt	million metric ton(s)
7	ha	hectare(s)	MPa	megapascal(s)
8	Hz	hertz	mph	mile(s) per hour
9			MW	megawatt(s)
10	in.	inch(es)	MWe	megawatt(s) electric
11			MWh	megawatt-hour(s)
12	J	joule(s)		
13			ppm	part(s) per million
14	K	degree(s) Kelvin	psi	pound(s) per square inch
15	kcal	kilocalorie(s)	psia	pound(s) per square inch absolute
16	kg	kilogram(s)		
17	kHz	kilohertz	rpm	rotation(s) per minute
18	km	kilometer(s)		
19	km ²	square kilometer(s)	s	second(s)
20	kPa	kilopascal(s)	scf	standard cubic foot (feet)
21	kV	kilovolt(s)		
22	kVA	kilovolt-ampere(s)	TWh	terawatt hours
23	kW	kilowatt(s)		
24	kWh	kilowatt-hour(s)	VdB	vibration velocity decibel(s)
25	kWp	kilowatt peak		
26			W	watt(s)
27	L	liter(s)		
28	lb	pound(s)	yd ²	square yard(s)
29			yd ³	cubic yard(s)
30	m	meter(s)	yr	year(s)
31	m ²	square meter(s)		
32	m ³	cubic meter(s)	µg	microgram(s)
33	mg	milligram(s)	µm	micrometer(s)

ENGLISH/METRIC AND METRIC/ENGLISH EQUIVALENTS

The following table lists the appropriate equivalents for English and metric units.

Multiply	By	To Obtain
<i>English/Metric Equivalents</i>		
acres	0.004047	square kilometers (km ²)
acre-feet (ac-ft)	1.234	cubic meters (m ³)
cubic feet (ft ³)	0.02832	cubic meters (m ³)
cubic yards (yd ³)	0.7646	cubic meters (m ³)
degrees Fahrenheit (°F) –32	0.5555	degrees Celsius (°C)
feet (ft)	0.3048	meters (m)
gallons (gal)	3.785	liters (L)
gallons (gal)	0.003785	cubic meters (m ³)
inches (in.)	2.540	centimeters (cm)
miles (mi)	1.609	kilometers (km)
miles per hour (mph)	1.609	kilometers per hour (kph)
pounds (lb)	0.4536	kilograms (kg)
short tons (tons)	907.2	kilograms (kg)
short tons (tons)	0.9072	metric tons (t)
square feet (ft ²)	0.09290	square meters (m ²)
square yards (yd ²)	0.8361	square meters (m ²)
square miles (mi ²)	2.590	square kilometers (km ²)
yards (yd)	0.9144	meters (m)
<i>Metric/English Equivalents</i>		
centimeters (cm)	0.3937	inches (in.)
cubic meters (m ³)	0.00081	acre-feet (ac-ft)
cubic meters (m ³)	35.31	cubic feet (ft ³)
cubic meters (m ³)	1.308	cubic yards (yd ³)
cubic meters (m ³)	264.2	gallons (gal)
degrees Celsius (°C) +17.78	1.8	degrees Fahrenheit (°F)
hectares (ha)	2.471	acres
kilograms (kg)	2.205	pounds (lb)
kilograms (kg)	0.001102	short tons (tons)
kilometers (km)	0.6214	miles (mi)
kilometers per hour (kph)	0.6214	miles per hour (mph)
liters (L)	0.2642	gallons (gal)
meters (m)	3.281	feet (ft)
meters (m)	1.094	yards (yd)
metric tons (t)	1.102	short tons (tons)
square kilometers (km ²)	247.1	acres
square kilometers (km ²)	0.3861	square miles (mi ²)
square meters (m ²)	10.76	square feet (ft ²)
square meters (m ²)	1.196	square yards (yd ²)

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