FES 12-24 • DOE/EIS-0403

Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States

Volume 6, Part 1
Appendices A–I

July 2012

Bureau of Land Management
U.S. Department of Energy

Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States (FES 12-24; 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; Doña 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.

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Abstract: The BLM and DOE have jointly prepared this PEIS to evaluate actions that the agencies are considering taking to further facilitate utility-scale solar energy development in six southwestern states.[1] For the BLM, this includes the evaluation of a new Solar Energy Program applicable to solar development on BLM-administered lands. For DOE, it includes the evaluation of developing new guidance to further facilitate utility-scale solar energy development and maximize the mitigation of associated potential environmental impacts. This Solar PEIS evaluates the potential environmental, social, and economic effects of the agencies' proposed actions and alternatives in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality's regulations for implementing NEPA (Title 40, Parts 1500–1508 of the *Code of Federal Regulations* [40 CFR Parts 1500–1508]), and applicable BLM and DOE authorities.

For the BLM, the Final Solar 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 that involve implementing a new BLM Solar Energy Program that would allow the permitting of future solar energy development projects on public lands to proceed in a more efficient, standardized, and environmentally responsible manner. The proposed program would establish right-of-way authorization policies and design features applicable to all utility-scale solar energy development on BLM-administered lands. It would identify categories of lands to be excluded from utility-scale solar energy development and specific locations well suited for utility-scale production of solar energy where the BLM would prioritize development (i.e., solar energy zones or SEZs). The proposed action would also allow for responsible utility-scale solar development on lands outside of priority areas.

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1 Utility-scale facilities are defined as projects that generate electricity that is delivered into the electricity transmission grid, generally with capacities greater than 20 megawatts (MW).

For DOE, the Final PEIS analyzes a no action alternative, under which DOE would continue to address environmental concerns for DOE-supported solar projects on a case-by-case basis, and an action alternative, under which DOE would adopt programmatic environmental guidance for use in DOE-supported solar projects.

The BLM and DOE initiated the Solar PEIS process in May 2008. On December 17, 2010, the BLM and DOE published the Draft Solar PEIS. Subsequently, on October 28, 2011, the lead agencies published the Supplement to the Draft Solar PEIS, in which adjustments were made to elements of BLM's proposed Solar Energy Program to better meet BLM's solar energy objectives, and in which DOE's proposed programmatic environmental guidance was presented.

SOLAR PEIS CONTENTS

VOLUME 1

Executive Summary
Chapter 1: Introduction
Chapter 2: Description of Alternatives and Reasonably Forseeable Development Scenario
Chapter 3: Update to Overview of Solar Energy Power Production Technologies, Development, and Regulation
Chapter 4: Update to Affected Environment
Chapter 5: Update to 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: Update to Consultation and Coordination Undertaken to Support Preparation of the PEIS
Chapter 15: List of Preparers
Chapter 16: Glossary

VOLUME 2

Chapter 8: Update to Affected Environment and Impact Assessment for Proposed Solar Energy Zones in Arizona
Chapter 9: Update to Affected Environment and Impact Assessment for Proposed Solar Energy Zones in California

VOLUME 3

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

VOLUME 4

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

VOLUME 5

Chapter 12: Update to Affected Environment and Impact Assessment for Proposed Solar Energy Zones in New Mexico
Chapter 13: Update to Affected Environment and Impact Assessment for Proposed Solar Energy Zones in Utah

SOLAR PEIS CONTENTS (Cont.)

VOLUME 6

Appendix A: Current and Proposed Bureau of Land Management Solar Energy Development Policies and Design Features
Appendix B: Approved and Pending 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: Update to Summary of Regional Initiatives and State Plans for Solar Energy Development and Transmission Development to Support Renewable Energy Development
Appendix E: Update to Methods for Estimating Reasonably Foreseeable Development Scenarios for Solar Energy Development
Appendix F: Update to Solar Energy Technology Overview
Appendix G: Update to Transmission Constraint Analysis
Appendix H: Update to Federal, State, and County Requirements Potentially Applicable to Solar Energy Projects
Appendix I: Update to 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: Update to Government-to-Government and Cultural Resource Consultations
Appendix L: Update to GIS Data Sources and Methodology
Appendix M: Update to Methodologies and Data Sources for the Analysis of Impacts of Solar Energy Development on Resources
Appendix N: Update to Viewshed Maps for Proposed Solar Energy Zones
Appendix O: Intermittent/Ephemeral Stream Evaluation and Groundwater Modeling Analyses

VOLUME 7

Comments and Responses for the Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States

VOLUME 6, PART 1 CONTENTS

NOTATION v

ENGLISH/METRIC AND METRIC/ENGLISH EQUIVALENTS xviii

APPENDIX A: BUREAU OF LAND MANAGEMENT PROPOSED SOLAR ENERGY DEVELOPMENT PROGRAM ELEMENTS A-1

A.1 Interim BLM Solar Energy Development Policies A-1
A.2 BLM Proposed Solar Energy Program A-4
A.2.1 Proposed Solar Energy Development Policies A-4
A.2.2 Proposed Programmatic Design Features A-5
A.2.2.1 Design Features for Lands and Realty A-6
A.2.2.2 Design Features for Specially Designated Areas and Lands with Wilderness Characteristics A-9
A.2.2.3 Design Features for Rangeland Resources – Grazing A-11
A.2.2.4 Design Features for Wild Horses and Burros A-11
A.2.2.5 Design Features for Wildland Fire A-13
A.2.2.6 Design Features for Public Access and Recreation Impacts A-14
A.2.2.7 Design Features for Military and Civilian Aviation A-16
A.2.2.8 Design Features for Soil Resources and Geologic Hazards A-16
A.2.2.9 Design Features for Mineral Resources A-21
A.2.2.10 Design Features for Water Resources A-22
A.2.2.11 Design Features for Ecological Resources A-29
A.2.2.12 Design Features for Air Quality and Climate A-44
A.2.2.13 Design Features for Visual Resources A-48
A.2.2.14 Design Features for Noise A-59
A.2.2.15 Design Features for Paleontological Resources A-63
A.2.2.16 Design Features for Cultural Resources A-64
A.2.2.17 Design Features for Native American Concerns A-69
A.2.2.18 Design Features for Socioeconomic Impacts A-72
A.2.2.19 Design Features for Environmental Justice Impacts A-73
A.2.2.20 Design Features for Transportation Impacts A-73
A.2.2.21 Design Features for Hazardous Materials and Waste A-76
A.2.2.22 Design Features To Ensure Health and Safety A-79
A.2.2.23 Design Features for National Scenic and Historic Trails, Suitable Trails, and Study Trails A-82
A.2.3 Proposed Solar Energy Zone-Specific Design Features A-85
A.2.4 Framework for Developing a Monitoring and Adaptive Management Plan for the BLM's Solar Energy Program A-103
A.2.4.1 Background A-103
A.2.4.2 Introduction to the AIM Strategy A-104

CONTENTS (Cont.)

A.2.4.3 Building and Testing a Solar LTMP A-111
A.2.5 Draft Framework for Developing Regional Mitigation Plans for the BLM's Solar Energy Program A-112
A.2.5.1 Purpose A-112
A.2.5.2 Mitigation Hierarchy A-112
A.2.5.3 Regional Mitigation Plan Elements A-115
A.2.5.4 Building and Testing the Framework for Regional Mitigation Plans for SEZs A-119
A.2.6 Proposed Solar Energy Zone Identification Protocol A-121
A.2.6.1 Assess the Demand for New or Expanded SEZs A-122
A.2.6.2 Establish Technical and Economic Suitability Criteria A-123
A.2.6.3 Apply Environmental, Cultural, and Other Screening Criteria A-125
A.2.6.4 Analyze Proposed SEZs through a Planning and NEPA Process A-128
A.2.7 References A-131

APPENDIX B: APPROVED AND PENDING SOLAR APPLICATIONS B-1

B.1 Background B-1
B.2 References B-12

APPENDIX C: PROPOSED BLM LAND USE PLAN AMENDMENTS UNDER THE BLM ACTION ALTERNATIVES OF THE SOLAR ENERGY DEVELOPMENT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT C-1

APPENDIX D: UPDATE TO SUMMARY OF REGIONAL INITIATIVES AND STATE PLANS FOR SOLAR ENERGY DEVELOPMENT AND TRANSMISSION DEVELOPMENT TO SUPPORT RENEWABLE ENERGY DEVELOPMENT D-1

APPENDIX E: UPDATE TO METHODS FOR ESTIMATING REASONABLY FORESEEABLE DEVELOPMENT SCENARIOS FOR SOLAR ENERGY DEVELOPMENT E-1

APPENDIX F: UPDATE TO SOLAR ENERGY TECHNOLOGY OVERVIEW F-1

APPENDIX G: UPDATE TO TRANSMISSION CONSTRAINT ANALYSIS G-1

G.1 Transmission Access Considerations G-1
G.2 Transmission Constraint Analysis for BLM-Administered Lands G-1

CONTENTS (Cont.)

G.3 References for Appendix G of the Draft Solar PEIS G-1
G.4 Additional Transmission Analysis for the Final Solar PEIS G-2
G.4.1 Background for Additional Transmission Analysis..... G-2
G.4.2 Factors Limiting Predictability of Future Transmission Needs for the SEZs G-4
G.4.3 Methodology for SEZ-Specific Transmission Analyses G-7
G.4.3.1 Methodology for Identifying Likely Load Areas G-8
G.4.3.2 Transmission Analysis Methodology G-13
G.4.3.3 Testing and Review of DLT Methodology..... G-20
G.4.4 Transmission Analysis – Next Steps G-21
G.4.5 References for the Additional Transmission Analysis G-24

APPENDIX H: UPDATE TO FEDERAL, STATE, AND COUNTY REQUIREMENTS POTENTIALLY APPLICABLE TO SOLAR ENERGY PROJECTS H-1

APPENDIX I: UPDATE TO ECOREGIONS OF THE SIX-STATE STUDY AREA AND LAND COVER TYPES OF THE PROPOSED SOLAR ENERGY ZONES I-1

FIGURES

A.2.4-1 Framework for the AIM Strategy A-104

G.4-1 Schematic Representation of DLT Load Areas, Solar-Eligible Loads, and Line Voltage Optimization Framework G-13

I-1 Level III Ecoregions in the Six-State Study Area..... I-2

TABLES

A.2-1 Individual Plans Specified as Elements of the Proposed Programmatic Design Features A-7

A.2-2 Proposed Solar Energy Zone-Specific Design Features A-86

B-1 Approved Solar Applications on BLM-Administered Lands as of May 31, 2012 ..... B-2

TABLES (Cont.)

B-2	First In-line Pending Solar Applications on BLM-Administered Lands	B-4
B-3	Summary Table for Pending Applications	B-12
C-1	Proposed Land Use Plans To Be Amended and Proposed Acreage Available for Application for Solar Energy Development by Planning Area	C-2
D-1	Update to Summary Information about Regional and Initiatives and State Plans for Solar Energy Development and Transmission Development to Support Renewable Energy Development	D-2
G.4-1	Summary of Transmission Line Characteristics	G-16

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
ACHP	Advisory Council on Historic Preservation
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AERMOD	AMS/EPA Regulatory Model
AFC	Application for Certification
AGL	above ground level
AIM	Assessment, Inventory and Monitoring
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
APS	Arizona Public Service
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
AVSE	Arlington Valley Solar Energy
AVWS	Audio Visual Warning System
AWBA	Arizona Water Banking Authority
AWEA	American Wind Energy Association
AWRM	Active Water Resource Management
AZDA	Arizona Department of Agriculture
AZGFD	Arizona Game and Fish Department

AZGS	Arizona Geological Survey
BA	biological assessment
BAP	base annual production
BEA	Bureau of Economic Analysis
BISON-M	Biota Information System of New Mexico
BLM	Bureau of Land Management
BLM-CA	Bureau of Land Management, California
BMP	best management practice
BNSF	Burlington Northern Santa Fe
BO	biological opinion
BOR	U.S. Bureau of Reclamation
BPA	Bonneville Power Administration
BRAC	Blue Ribbon Advisory Council on Climate Change
BSE	Beacon Solar Energy
BSEP	Beacon Solar Energy Project
BTS	Bureau of Transportation Statistics
CAA	Clean Air Act
CAAQS	California Air Quality Standards
CAISO	California Independent System Operator
Caltrans	California Department of Transportation
C-AMA	California-Arizona Maneuver Area
CAP	Central Arizona Project
CARB	California Air Resources Board
CAReGAP	California Regional Gap Analysis Project
CASQA	California Stormwater Quality Association
CASTNET	Clean Air Status and Trends NETwork
CAWA	Colorado Agricultural Water Alliance
CCC	Civilian Conservation Corps
CDC	Centers for Disease Control and Prevention
CDCA	California Desert Conservation Area
CDFG	California Department of Fish and Game
CDNCA	California Desert National Conservation Area
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife (now Colorado Parks and Wildlife)
CDPHE	Colorado Department of Public Health and Environment
CDWR	California Department of Water Resources
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CES	constant elasticity of substitution
CESA	California Endangered Species Act
CESF	Carrizo Energy Solar Farm
CFR	*Code of Federal Regulations*
CGE	computable general equilibrium
CHAT	crucial habitat assessment tool

CIRA	Cooperative Institute for Research in the Atmosphere
CLFR	compact linear Fresnel reflector
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNHP	Colorado National Heritage Program
Colorado DWR	Colorado Division of Water Resources
CO_2e	carbon dioxide equivalent
CPC	Center for Plant Conservation
CPUC	California Public Utilities Commission
CPV	concentrating photovoltaic
CRBSCF	Colorado River Basin Salinity Control Forum
CREZ	competitive renewable energy zone
CRPC	Cultural Resources Preservation Council
CRSCP	Colorado River Salinity Control Program
CSA	Candidate Study Area
CSC	Coastal Services Center
CSFG	carbon-sequestration fossil generation
CSP	concentrating solar power
CSQA	California Stormwater Quality Association
CSRI	Cultural Systems Research, Incorporated
CTG	combustion turbine generator
CTPG	California Transmission Planning Group
CTSR	Cumbres & Toltec Scenic Railroad
CUP	Conditional Use Permit
CVP	Central Valley Project
CWA	Clean Water Act
CWCB	Colorado Water Conservation Board
CWHRS	California Wildlife Habitat Relationship System
DC	direct current
DEM	digital elevation model
DHS	U.S. Department of Homeland Security
DIMA	Database for Inventory, Monitoring and Assessment
DLT	dedicated-line transmission
DNA	Determination of NEPA Adequacy
DNI	direct normal insulation
DNL	day-night average sound level
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOL	U.S. Department of Labor
DOT	U.S. Department of Transportation
DRECP	California Desert Renewable Energy Conservation Plan
DSM	demand-side management
DSRP	Decommissioning and Site Reclamation Plan
DTC/C-AMA	Desert Training Center/California–Arizona Maneuver Area

DWMA	Desert Wildlife Management Area
DWR	Division of Water Resources
EA	environmental assessment
EBID	Elephant Butte Irrigation District
ECAR	East Central Area Reliability Coordination Agreement
ECOS	Environmental Conservation Online System (USFWS)
EERE	Energy Efficiency and Renewable Energy (DOE)
Eg	band gap energy
EIA	Energy Information Administration (DOE)
EIS	environmental impact statement
EISA	Energy Independence and Security Act of 2007
EMF	electromagnetic field
E.O.	Executive Order
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EQIP	Environmental Quality Incentives Program
ERCOT	Electric Reliability Council of Texas
ERO	Electric Reliability Organization
ERS	Economic Research Service
ESA	Endangered Species Act of 1973
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FLPMA	Federal Land Policy and Management Act of 1976
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FRCC	Florida Reliability Coordinating Council
FSA	Final Staff Assessment
FTE	full-time equivalent
FY	fiscal year
G&TM	generation and transmission modeling
GCRP	U.S. Global Climate Research Program
GDA	generation development area
GHG	greenhouse gas
GIS	geographic information system
GMU	game management unit
GPS	global positioning system
GTM	Generation and Transmission Model

GUAC	Groundwater Users Advisory Council
GWP	global warming potential
HA	herd area
HAP	hazardous air pollutant
HAZCOM	hazard communication
HCE	heat collection element
HCP	Habitat Conservation Plan
HMA	herd management area
HMMH	Harris Miller Miller & Hanson, Inc.
HRSG	heat recovery steam generator
HSPD	Homeland Security Presidential Directive
HTF	heat transfer fluid
HUC	hydrologic unit code
HVAC	heating, ventilation, and air-conditioning
I	Interstate
IARC	International Agency for Research on Cancer
IBA	important bird area
ICE	internal combustion engine
ICPDS	Imperial County Planning & Development Services
ICWMA	Imperial County Weed Management Area
IDT	interdisplinary team
IEC	International Electrochemical Commission
IFR	instrument flight rule
IID	Imperial Irrigation District
IM	Instruction Memorandum
IMPS	Iron Mountain Pumping Station
IMS	interim mitigation strategy
INA	Irrigation Non-Expansion Area
IOP	Interagency Operating Procedure
IOU	investor-owned utility
IPCC	Intergovernmental Panel on Climate Change
ISA	Independent Science Advisor; Instant Study Area
ISB	Intermontane Seismic Belt
ISCC	integrated solar combined cycle
ISDRA	Imperial Sand Dunes Recreation Area
ISEGS	Ivanpah Solar Energy Generating System
ISO	independent system operator; iterative self-organizing
ITFR	Interim Temporary Final Rulemaking
ITP	incidental take permit
IUCNNR	International Union for Conservation of Nature and Natural Resources
IUCNP	International Union for Conservation of Nature Pakistan
KGA	known geothermal resources area

KML	keyhole markup language
KOP	key observation point
KSLA	known sodium leasing area
LCC	Landscape Conservation Cooperative
LCCRDA	Lincoln County Conservation, Recreation, and Development Act of 2004
LCOE	levelized cost of energy
L_{dn}	day-night average sound level
LDWMA	Low Desert Weed Management Area
L_{eq}	equivalent sound pressure level
LiDAR	light detection and ranging
LLA	limited land available
LLRW	low-level radioactive waste (waste classification)
LPN	listing priority number
LRG	Lower Rio Grande
LSA	lake and streambed alteration
LSE	load-serving entity
LTMP	long-term monitoring and adaptive management plan
LTVA	long-term visitor area
MAAC	Mid-Atlantic Area Council
MAIN	Mid-Atlantic Interconnected Network
MAPP	methyl acetylene propadiene stabilizer; Mid-Continent Area Power Pool
MCAS	Marine Corps Air Station
MCL	maximum contaminant level
MEB	Marine Expeditionary Brigade
MFP	Management Framework Plan
MIG	Minnesota IMPLAN Group
MLA	maximum land available
MOA	military operating area
MOU	Memorandum of Understanding
MPDS	maximum potential development scenario
MRA	Multiple Resource Area
MRI	Midwest Research Institute
MRO	Midwest Reliability Organization
MSDS	Material Safety Data Sheet
MSL	mean sea level
MTR	military training route
MVEDA	Mesilla Valley Economic Development Alliance
MWA	Mojave Water Agency
MWD	Metropolitan Water District
MWMA	Mojave Weed Management Area
NAAQS	National Ambient Air Quality Standard(s)
NADP	National Atmospheric Deposition Program
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission (California)

NAIC	North American Industrial Classification System
NASA	National Aeronautics and Space Administration
NCA	National Conservation Area
NCCAC	Nevada Climate Change Advisory Committee
NCDC	National Climatic Data Center
NCES	National Center for Education Statistics
NDAA	National Defense Authorization Act
NDCNR	Nevada Department of Conservation and Natural Resources
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NDWP	Nevada Division of Water Planning
NDWR	Nevada Division of Water Resources
NEAP	Natural Events Action Plan
NEC	National Electric Code
NED	National Elevation Database
NEP	Natural Events Policy
NEPA	National Environmental Policy Act of 1969
NERC	North American Electricity Reliability Corporation
NGO	non-governmental organization
NHA	National Heritage Area
NHD	National Hydrography Dataset
NHNM	National Heritage New Mexico
NHPA	National Historic Preservation Act of 1966
NID	National Inventory of Dams
NLCS	National Landscape Conservation System
NMAC	*New Mexico Administrative Code*
NMBGMR	New Mexico Bureau of Geology and Mineral Resources
NMDGF	New Mexico Department of Game and Fish
NM DOT	New Mexico Department of Transportation
NMED	New Mexico Environment Department
NMED-AQB	New Mexico Environment Department-Air Quality Board
NMFS	National Marine Fisheries Service
NMOSE	New Mexico Office of the State Engineer
NMSU	New Mexico State University
NNHP	Nevada Natural Heritage Program
NNL	National Natural Landmark
NNSA	National Nuclear Security Administration
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NP	National Park
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NPV	net present value

NRA	National Recreation Area
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NRHP	*National Register of Historic Places*
NRS	*Nevada Revised Statutes*
NSC	National Safety Council
NSO	no surface occupancy
NSTC	National Science and Technology Council
NTHP	National Trust for Historic Preservation
NTS	Nevada Test Site
NTTR	Nevada Test and Training Range
NVCRS	Nevada Cultural Resources Inventory System
NV DOT	Nevada Department of Transportation
NWCC	National Wind Coordinating Committee
NWI	National Wetlands Inventory
NWIS	National Water Information System (USGS)
NWPP	Northwest Power Pool
NWR	National Wildlife Refuge
NWSRS	National Wild and Scenic River System
O&M	operation and maintenance
ODFW	Oregon Department of Fish and Wildlife
OHV	off-highway vehicle
ONA	Outstanding Natural Area
ORC	organic Rankine cycle
OSE/ISC	Office of the State Engineer/Interstate Stream Commission
OSHA	Occupational Safety and Health Administration
OTA	Office of Technology Assessment
PA	Programmatic Agreement
PAD	Preliminary Application Document
PAH	polycyclic aromatic hydrocarbon
PAT	peer analysis tool
PCB	polychlorinated biphenyl
PCM	purchase change material
PCS	power conditioning system
PCU	power converting unit
PEIS	programmatic environmental impact statement
PFYC	potential fossil yield classification
PGH	Preliminary General Habitat
PIER	Public Interest Energy Research
P.L.	Public Law
PLSS	Public Land Survey System
PM	particulate matter
$PM_{2.5}$	particulate matter with a diameter of 2.5 μm or less
PM_{10}	particulate matter with a diameter of 10 μm or less

PPA	Power Purchase Agreement
P-P-D	population-to-power density
PPH	Preliminary Priority Habitat
POD	plan of development
POU	publicly owned utility
PPA	Power Purchase Agreement
PPE	personal protective equipment
PSD	Prevention of Significant Deterioration
PURPA	Public Utility Regulatory Policy Act
PV	photovoltaic
PVID	Palo Verde Irrigation District
PWR	public water reserve
QRA	qualified resource area
R&I	relevance and importance
RAC	Resource Advisory Council
RCE	Reclamation Cost Estimate
RCI	residential, commercial, and industrial (sector)
RCRA	Resource Conservation and Recovery Act of 1976
RD&D	research, development, and demonstration; research, development, and deployment
RDBMS	Relational Database Management System
RDEP	Restoration Design Energy Project
REA	Rapid Ecoregional Assessment
REAT	Renewable Energy Action Team
REDA	Renewable Energy Development Area
REDI	Renewable Energy Development Infrastructure
REEA	Renewable Energy Evaluation Area
ReEDS	Regional Energy Deployment System
REPG	Renewable Energy Policy Group
RETA	Renewable Energy Transmission Authority
RETAAC	Renewable Energy Transmission Access Advisory Committee
RETI	Renewable Energy Transmission Initiative
REZ	renewable energy zone
RF	radio frequency
RFC	Reliability First Corporation
RFDS	reasonably foreseeable development scenario
RGP	Rio Grande Project
RGWCD	Rio Grande Water Conservation District
RMP	Resource Management Plan
RMPA	Rocky Mountain Power Area
RMZ	Resource Management Zone
ROD	Record of Decision
ROI	region of influence
ROS	recreation opportunity spectrum

ROW	right-of-way
RPG	renewable portfolio goal
RPS	Renewable Portfolio Standard
RRC	Regional Reliability Council
RSEP	Rice Solar Energy Project
RSI	Renewable Systems Interconnection
RTO	regional transmission organization
RTTF	Renewable Transmission Task Force
RV	recreational vehicle
SAAQS	State Ambient Air Quality Standard(s)
SAMHSA	Substance Abuse and Mental Health Services Administration
SCADA	supervisory control and data acquisition
SCE	Southern California Edison
SCRMA	Special Cultural Resource Management Area
SDRREG	San Diego Regional Renewable Energy Group
SDWA	Safe Drinking Water Act of 1974
SEGIS	Solar Energy Grid Integration System
SEGS	Solar Energy Generating System
SEI	Sustainable Energy Ireland
SEIA	Solar Energy Industrial Association
SES	Stirling Energy Systems
SETP	Solar Energy Technologies Program (DOE)
SEZ	solar energy zone
SHPO	State Historic Preservation Office(r)
SIP	State Implementation Plan
SLRG	San Luis & Rio Grande
SMA	Special Management Area
SMART	specific, measurable, achievable, relevant, and time sensitive
SMP	suggested management practice
SNWA	Southern Nevada Water Authority
SPP	Southwest Power Pool
SRMA	Special Recreation Management Area
SSA	Socorro Seismic Anomaly
SSI	self-supplied industry
ST	solar thermal
STG	steam turbine generator
SUA	special use airspace
SWAT	Southwest Area Transmission
SWIP	Southwest Intertie Project
SWPPP	Stormwater Pollution Prevention Plan
SWReGAP	Southwest Regional Gap Analysis Project
TAP	toxic air pollutant
TCC	Transmission Corridor Committee
TDS	total dissolved solids

TEPPC	Transmission Expansion Planning Policy Committee
TES	thermal energy storage
TRACE	Transmission Routing and Configuration Estimator
TSA	Transportation Security Administration
TSCA	Toxic Substances Control Act of 1976
TSDF	treatment, storage, and disposal facility
TSP	total suspended particulates
UACD	Utah Association of Conservation Districts
UBWR	Utah Board of Water Resources
UDA	Utah Department of Agriculture
UDEQ	Utah Department of Environmental Quality
UDNR	Utah Department of Natural Resources
UDOT	Utah Department of Transportation
UDWQ	Utah Division of Water Quality
UDWR	Utah Division of Wildlife Resources
UGS	Utah Geological Survey
UNEP	United Nations Environmental Programme
UNPS	Utah Native Plant Society
UP	Union Pacific
UREZ	Utah Renewable Energy Zone
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USC	*United States Code*
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
Utah DWR	Utah Division of Water Rights
UTTR	Utah Test and Training Range
UWS	Underground Water Storage, Savings and Replenishment Act
VACAR	Virginia–Carolinas Subregion
VCRS	Visual Contrast Rating System
VFR	visual flight rule
VOC	volatile organic compound
VRHCRP	Virgin River Habitat Conservation & Recovery Program
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WA	Wilderness Area
WECC	Western Electricity Coordinating Council
WECC CAN	Western Electricity Coordinating Council–Canada
WEG	wind erodibility group
Western	Western Area Power Administration
WGA	Western Governors' Association

WGFD	Wyoming Game and Fish Department
WHA	wildlife habitat area
WHO	World Health Organization
WIA	Wyoming Infrastructure Authority
WRAP	Water Resources Allocation Program; Western Regional Air Partnership
WRCC	Western Regional Climate Center
WREZ	Western Renewable Energy Zones
WRRI	Water Resources Research Institute
WSA	Wilderness Study Area
WSC	wildlife species of special concern
WSMR	White Sands Missile Range
WSR	Wild and Scenic River
WSRA	Wild and Scenic Rivers Act of 1968
WWII	World War II
WWP	Western Watersheds Project
YPG	Yuma Proving Ground
ZITA	zone identification and technical analysis
ZLD	zero liquid discharge

CHEMICALS

CH_4	methane	NO_2	nitrogen dioxide
CO	carbon monoxide	NO_x	nitrogen oxides
CO_2	carbon dioxide		
		O_3	ozone
H_2S	hydrogen sulfide		
Hg	mercury	Pb	lead
N_2O	nitrous oxide	SF_6	sulfur hexafluoride
NH_3	ammonia	SO_2	sulfur dioxide
		SO_x	sulfur oxides

UNITS OF MEASURE

ac-ft	acre-foot (feet)	dB	decibel(s)	
bhp	brake horsepower			
°C	degree(s) Celsius			
cf	cubic foot (feet)			
cfs	cubic foot (feet) per second			
cm	centimeter(s)			

	dBA	A-weighted decibel(s)
	°F	degree(s) Fahrenheit
	ft	foot (feet)
	ft^2	square foot (feet)
	ft^3	cubic foot (feet)
	g	gram(s)
	gal	gallon(s)
1	GJ	gigajoule(s)
2	gpcd	gallon per capita per day
3	gpd	gallon(s) per day
4	gpm	gallon(s) per minute
5	GW	gigawatt(s)
6	GWh	gigawatt hour(s)
7	GWh/yr	gigawatt hour(s) per year
8		
9	h	hour(s)
10	ha	hectare(s)
11	Hz	hertz
12		
13	in.	inch(es)
14		
15	J	joule(s)
16		
17	K	degree(s) Kelvin
18	kcal	kilocalorie(s)
19	kg	kilogram(s)
20	kHz	kilohertz
21	km	kilometer(s)
22	km^2	square kilometer(s)
23	kPa	kilopascal(s)
24	kV	kilovolt(s)
25	kVA	kilovolt-ampere(s)
26	kW	kilowatt(s)
27	kWh	kilowatt-hour(s)
28	kWp	kilowatt peak
29		
30	L	liter(s)
31	lb	pound(s)
32		
33	m	meter(s)
34	m^2	square meter(s)
35	m^3	cubic meter(s)
36	mg	milligram(s)
37	Mgal	million gallons
38	mi	mile(s)
39	mi^2	square mile(s)
40	min	minute(s)
41	mm	millimeter(s)
42	MMt	million metric ton(s)
43	MPa	megapascal(s)
44	mph	mile(s) per hour
45	MVA	megavolt-ampere(s)
46	MW	megawatt(s)
	MWe	megawatt(s) electric
	MWh	megawatt-hour(s)
	ppm	part(s) per million
	psi	pound(s) per square inch
	psia	pound(s) per square inch absolute
	rpm	rotation(s) per minute
	s	second(s)
	scf	standard cubic foot (feet)
	TWh	terawatt hour(s)
	VdB	vibration velocity decibel(s)
	W	watt(s)
	yd^2	square yard(s)
	yd^3	cubic yard(s)
	yr	year(s)
	µg	microgram(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
English/Metric Equivalents		
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 (ºF) –32	0.5555	degrees Celsius (ºC)
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)
Metric/English Equivalents		
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 (ºC) +17.78	1.8	degrees Fahrenheit (ºF)
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)

APPENDIX A:

BUREAU OF LAND MANAGEMENT PROPOSED SOLAR ENERGY DEVELOPMENT PROGRAM ELEMENTS

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APPENDIX A:

BUREAU OF LAND MANAGEMENT PROPOSED SOLAR ENERGY DEVELOPMENT PROGRAM ELEMENTS

This appendix presents the U.S. Department of the Interior (DOI) Bureau of Land Management's (BLM's) proposed Solar Energy Program elements for the Final *Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States* (Solar PEIS). The list of interim policies presented in Section A.1 (Interim Solar Energy Development Policies) of Appendix A of the Draft Solar PEIS has been revised and the policies have been summarized. The information that was presented in Section A.2.1 (Proposed Solar Energy Development Policies) of the Draft Solar PEIS is now presented in Chapter 2. Sections A.2.2 (Proposed Programmatic Design Features) and A.2.3 (Proposed SEZ-Specific Design Features) of the Draft Solar PEIS have been completely revised and are presented here in full. Additionally, new sections have been added that were not a part of the Draft Solar PEIS: BLM's framework for developing a monitoring and adaptive management plan (Section A.2.4); BLM's framework for developing regional mitigation plans (Section A.2.5); and the proposed SEZ identification protocol (Section A.2.6).

A.1 INTERIM BLM SOLAR ENERGY DEVELOPMENT POLICIES

The BLM has issued a number of instruction memoranda (IMs) related to the processing of solar right-of-way (ROW) applications. These IMs, listed below, are available for review on the project Web Site (http://solareis.anl.gov):

- ***IM 2007-097, Solar Energy Development Policy (April 4, 2007)***. This IM establishes policy for the processing of ROW applications for solar energy development projects on public lands administered by the BLM and evaluating the feasibility of installing solar energy systems on BLM administrative facilities and projects.

- ***IM 2010-141, Solar Energy Interim Rental Policy (June 10, 2010).*** This IM provides updated guidance on the rental provisions of ROW authorizations for solar energy projects on public lands administered by the BLM.

- ***IM 2011-003, Solar Energy Development Policy (October 7, 2010***). This IM provides updated guidance on the processing of ROW applications and the administration of ROW authorizations for solar energy projects on public lands administered by the BLM.

- ***IM 2011-059, National Environmental Policy Act Compliance for Utility-Scale Renewable Energy Right-of-Way Authorizations (February 7, 2011)***. The purpose of this IM is to reiterate and clarify existing BLM National Environmental Policy Act (NEPA) policy to assist offices that are analyzing

externally generated, utility-scale renewable energy ROW applications. It includes examples and guidance applicable to renewable energy ROW applications that supplement information in the BLM's NEPA Handbook (H-1790-1). Utility-scale renewable energy projects are distinct from many other types of land and realty actions due to their size and potential for significant resource conflicts, as well as the priority that has been placed on them by the DOI.

- ***IM 2011-060, Solar and Wind Energy Applications – Due Diligence (February 7, 2011)***. This IM provides updated guidance on the due diligence requirements of ROW applicants for solar and wind energy development projects on public lands administered by the BLM.

- ***IM 2011-061, Solar and Wind Energy Applications – Pre-application and Screening (February 7, 2011)***. This IM provides updated guidance on the review of ROW applications for solar and wind energy development projects on public lands administered by the BLM.

- ***IM 2011-181, Involvement of Grazing Permittee/Lessee with Solar and Wind Energy Right-of-Way Application Process (September 21, 2011)***. This IM clarifies when BLM Field Offices will notify a grazing permittee/lessee that a solar or wind energy development application may affect a livestock grazing operation. Specifically, Regulation 43 CFR 4110.4-2(b) requires that when public lands are disposed of or devoted to a public purpose that precludes livestock grazing, the permittee/lessee shall be given 2 years' prior notification (except in cases of emergency) before the grazing permit/lease and grazing preference may be cancelled. This IM also addresses potential mitigation and compensation strategies and the relationship of energy application steps/decisions with grazing administrative steps/decisions.

- ***IM 2011-183, Implementation Procedures – Interim Temporary Final Rule for Segregating Renewable Energy Right-of-Way Applications (September 21, 2011)***. This IM provides guidance on implementing the recently published rulemaking that grants authority for the temporary segregation of public lands. The segregation lasts for a period of up to 2 years to protect applications for solar or wind energy ROWs. This Interim Temporary Final Rulemaking (ITFR) was published in the Federal Register on April 26, 2011 (Volume 76, page 23198), as was a Proposed Rule containing the same language (Volume 76, page 23230). The rule is found in added sections 43 CFR 2091.3-1(e) and 43 CFR 2804.25(e), which comprise regulations for segregations in general and ROW protection through segregations, respectively. The ITFR was effective upon the date of publication. The BLM solicited comments until June 27, 2011, on both the ITFR and the Proposed Rule.

- ***IM 2012-032, Native American Consultation and Section 106 Compliance for the Solar Energy Program Described in the Solar PEIS (December 6, 2011)***. This IM establishes the schedule, procedures, and responsibilities for ongoing Native American consultation in connection with the completion of the Programmatic Environmental Impact Statement (PEIS) for the solar energy program. It also transmits a revised Draft Programmatic Agreement (PA) governing the BLM solar energy program's compliance with Section 106 of the National Historic Preservation Act.

A.2 BLM PROPOSED SOLAR ENERGY PROGRAM

A.2.1 Proposed Solar Energy Development Policies

For this Final Solar PEIS, the proposed solar energy development policies are presented as part of the Solar Energy Program in Chapter 2. The ROW authorization policies are presented in Section 2.2.1.1. The authorization policies for projects within solar energy zones (SEZs) are presented in Section 2.2.2.2. The variance process for ROW applications submitted in variance areas is presented in Section 2.2.2.3.

A.2.2 Proposed Programmatic Design Features

The BLM has established a set of proposed programmatic design features that would be required for all utility-scale solar energy projects on BLM-administered lands under both action alternatives. Design features are mitigation requirements that have been incorporated into the proposed action or alternatives to avoid and/or minimize adverse impacts. The proposed design features in this section are presented by resource type and by four project phases as applicable (i.e., [1] general; [2] site characterization, siting and design, and construction; [3] operations and maintenance; and [4] reclamation and decommissioning).

The proposed programmatic design features in this section address the broad possible range of direct and indirect impacts that may result from utility-scale solar energy development as described in Chapter 5 of the Draft and Final Solar PEIS. Utility-scale solar energy development necessarily includes the solar generation facilities themselves, as well as associated transmission facilities, roads, and other infrastructure. Applicants seeking approvals to construct utility-scale solar energy projects on BLM-administered lands will be required to avoid, minimize, and/or mitigate the impacts associated with their project in total. While the programmatic design features that follow address utility-scale solar energy projects comprehensively, the land use plan decisions to be made through the Solar PEIS ROD (e.g., exclusions and SEZs) will only be applicable to utility-scale solar energy generation facilities. Management decisions for supporting infrastructure would continue to be made in accordance with existing land use plan decisions and current applicable policy and procedures (see Section 1.3.2 in Chapter 1 of the Final Solar PEIS).

The proposed programmatic design features in this appendix were derived from comprehensive reviews of solar energy development activities; published data regarding solar energy development impacts; existing, relevant mitigation guidance; and standard industry practices. The BLM has revised the list of proposed programmatic design features based on input received through comments on the Draft Solar PEIS and additional outreach conducted between the publication of the Supplement to the Draft PEIS and this Final Solar PEIS.

Application of the proposed design features is intended to result in the avoidance, minimization, and/or mitigation of potential resource conflicts (e.g., night-sky impacts or impacts on wetlands). Due to site-specific circumstances, not all design features as written will apply to all projects (e.g., a resource is not present on a given site). Some design features may require variations from what is described (e.g., a larger or smaller protective area). In some cases, multiple options for addressing a potential resource conflict are provided. Applicants will be required to work with the BLM to address proposed variations in the design features and to discuss selected options for avoidance, minimization, and/or mitigation of potential resource conflicts. Variations in programmatic design features will require appropriate analysis and disclosure as part of individual project authorizations. Programmatic design features that do not apply to a given project should be described as part of the project case file along with an appropriate rationale. Additional mitigation measures may be identified and required during individual project development and environmental review.

The proposed programmatic design features will apply to all utility-scale solar energy projects on BLM-administered lands, whether those projects are within variance areas or SEZs. Based on the extensive upfront data collection and environmental analysis that has been completed for SEZs, the BLM expects that many of the requirements associated with programmatic design features will be met or substantially met for lands in SEZs. For example, as part of the Solar PEIS, the BLM has undertaken some groundwater modeling for SEZs. The programmatic design feature that requires the collection of such groundwater information therefore may have already been met. Further, because SEZs have been sited to avoid potential resource conflicts, the BLM expects that many design features will not be triggered.

The proposed programmatic design features are not intended to be duplicative of other federal, state, and/or local requirements. In the early stages of siting and design, project developers should coordinate with appropriate federal, state, and local agencies to determine what plans, permits, and/or approvals may be needed. Where possible, project developers should seek to consolidate such requirements in coordination with the BLM. In addition, the requirements of individual programmatic design features may be consolidated to further avoid duplication. The proposed programmatic design features are also not intended to be unduly burdensome to the applicant. For example, applicants will not be expected to study resources or collect data beyond what is necessary to disclose and provide knowledge of reasonable avoidance, minimization, and/or mitigation of impacts from a proposed project.

The BLM will require that the planning and minimization activities specified through the proposed programmatic design features be identified and disclosed as part of the project's Plan of Development (POD) to be submitted to the BLM with a ROW application for solar energy development on public lands. In situations where similar activities are required to meet other federal, state, and/or local permitting requirements, the BLM encourages developers to address these duplicative requirements in separate submittals and append the information to their POD. Examples of such information that may be required for a separate permitting action and appended to the POD include a Stormwater Pollution Prevention Plan, Dust Abatement Plan, and Decommissioning and Site Reclamation Plan (see Table A.2-1).

A.2.2.1 Design Features for Lands and Realty

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on lands and realty from solar development identified and discussed in Sections 5.2.1 and 5.2.2 of the Draft and Final Solar PEIS.

A.2.2.1.1 General

LR1-1 Project developers shall consult with the BLM in the early phases of project planning to identify potential land use conflicts and constraints.

(a) Identification of potential land use conflicts shall include, but is not limited to, the following:

TABLE A.2-1 Individual Plans Specified as Elements of the Proposed Programmatic Design Features[a,b]

Plan Name	Applicable Design Features[c]
Decommissioning and Site Reclamation Plan	ER4-1,,HMW-1
Dust Abatement Plan	ER1-1, AQC2-1
Hazardous Materials and Waste Management Plan	HMW1-1
Health and Safety Plan	HS1-1
Spill Prevention and Emergency Response Plan	WR2-1
Stormwater Pollution Prevention Plan	WR1-1
Worker Education and Awareness Plan (WEAP)	LR1-1, WHB1-1, WF1-1, ER1-1, P1-1, CR1-1

[a] The need for each plan will be determined on a project-specific basis.

[b] The number of plans in the Final Solar PEIS has been reduced substantially since the publication of the Draft Solar PEIS. Information associated with those plans that are no longer shown in this table will alternatively be incorporated into the Plan of Development.

[c] The design features specifying the need for individual plans are listed in Sections A.2.2.1 through A.2.2.22.

- Identifying potential land use conflicts in proximity to the proposed project. In coordination with the BLM, developers shall consult existing BLM land use plans and local land use plans, as well as with appropriate federal, state, and local agencies; affected tribes; and adjacent property owners.

- Identifying legal access to private, state, and federal lands surrounding the solar facilities and the potential to create areas that are inaccessible to the public.

- Considering the effects on the manageability and uses of public lands around boundaries of solar energy facilities.

- Considering the potential effects on prime and unique farmland.

- Evaluating land use impacts and constraints as part of the environmental impact analysis for the project and considering

options to avoid, minimize, and/or mitigate adverse impacts in coordination with the BLM.

- Providing notification to existing BLM ROW authorization holders within solar energy development areas, pursuant to Title 43, Part 2807.14 of the *Code of Federal Regulations* (43 CFR 2807.14), to inform them that an application that might affect their existing ROW has been filed and request their comments.

- Proposed solar developments within one-quarter mile of any project boundary will require issuance of a Chain of Survey Certificate in conformance with the Departmental standard. In some cases, Land Description Reviews, Certificates of Inspection and Possession, Boundary Assurance Certificates, resurveys, re-monumentation, and/or referencing of PLSS corners may be required before the start of any action.

(b) Methods to minimize land use conflicts and constraints may include, but are not limited to, the following:

- Informing project personnel of all laws and regulations that they may be subject to, such as international borders, limitations on the removal of salable materials such as stone or wood from a project site for personal use, and use of vehicles off of the project site in limited access areas. This information should be incorporated into a Worker Education and Awareness Plan (WEAP) that is provided to all project personnel prior to entering the project work site. The WEAP shall be provided on a regular basis, covering multiple resources, to ensure the awareness of key mitigation efforts of the project work site during all phases of the project's life. The base information the WEAP provides shall be reviewed and approved by the BLM prior to the issuance of a Notice to Proceed and incorporate adaptive management protocols for addressing changes over the life of the project, should they occur.

A.2.2.1.2 Site Characterization, Siting and Design, Construction

LR2-1 Solar facilities shall be sited, designed, and constructed to avoid, minimize, and/or mitigate impacts on BLM land use planning designations.

(a) Methods to minimize impacts on BLM land use planning designations may include, but are not limited to, the following:

- Locating existing designated transmission corridors within the area of a proposed solar energy development project in consultation with the BLM. Reviewing future transmission capacity in the corridor to determine whether the corridor should be excluded from solar development or whether the capacity of the designated transmission corridor can be reduced. Options to partially relocate the corridor to retain the current planned capacity or to relocate the solar project outside the designated corridor may be considered.

- Identifying and protecting evidence of the Public Land Survey System (PLSS) and related Federal property boundaries prior to commencement of any ground-disturbing activity. This will be accomplished by contacting BLM Cadastral Survey to coordinate data research, evidence examination and evaluation, and locating, referencing, or protecting monuments of the PLSS and related land boundary markers from destruction. In the event of obliteration or disturbance of the federal boundary evidence the responsible party shall immediately report the incident, in writing, to the Authorizing Official. BLM Cadastral Survey will determine how the marker is to be restored. In rehabilitating or replacing the evidence the responsible party will be instructed to use the services of a Certified Federal Surveyor (CFedS) whose procurement shall be per qualification-based selection, or to reimburse the BLM for costs. All surveying activities will conform to the Manual of Surveying Instructions and appropriate State laws and regulations. Local surveys will be reviewed by Cadastral Survey before being finalized or filed in the appropriate State or county office. The responsible party shall pay for all survey, investigation, penalty, and administrative costs.

- Considering opportunities to consolidate access to and other supporting infrastructure for single projects and for cases where there is more than one project in close proximity to another in order to maximize the efficient use of public land and minimize impacts.

A.2.2.2 Design Features for Specially Designated Areas and Lands with Wilderness Characteristics

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on specially designated areas and lands with wilderness characteristics from solar development identified and discussed in Sections 5.3.1 and 5.3.2 of the Draft and Final Solar PEIS.

A.2.2.2.1 General

LWC1-1 Protection of existing values of specially designated areas and lands with wilderness characteristics shall be evaluated during the environmental analysis for solar energy projects, and the results shall be incorporated into the project planning and design.

(a) Assessing potential impacts on specially designated areas and lands with wilderness characteristics shall include, but is not limited to, the following:

- Identifying specially designated areas and lands with wilderness characteristics in proximity to the proposed projects. In coordination with the BLM, developers shall consult existing land use plans and updated inventories.

- Identifying lands that are within the geographic scope of a proposed solar project that have not been recently inventoried for wilderness characteristics or any lands that have been identified in a citizen's wilderness proposal in order to determine whether they possess wilderness characteristics. Developers shall consider including the wilderness characteristics evaluation as part of the processing of a solar energy ROW application for those lands without a recent wilderness characteristics inventory. All work must be completed in accordance with current BLM policies and procedures.

- Evaluating impacts on specially designated areas and lands with wilderness characteristics as part of the environmental impact analysis for the project and considering options to avoid, minimize, and/or mitigate adverse impacts in coordination with the BLM.

A.2.2.2.2 Site Characterization, Siting and Design, Construction

LWC2-1 Solar facilities shall be sited, designed, and constructed to avoid, minimize, and/or mitigate impacts on the values of specially designated areas and lands with wilderness characteristics.[1]

[1] See Section 4.3 of the Final Solar PEIS for details on areas included in these categories.

A.2.2.3 Design Features for Rangeland Resources – Grazing

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on grazing from solar development identified and discussed in Sections 5.4.1.1 and 5.4.1.2 of the Draft and Final Solar PEIS.

A.2.2.3.1 General

RG1-1 Project developers shall consult with the BLM early in project planning to identify activities that could impact rangeland resources and grazing.

(a) Identifying impacts on rangeland resources and grazing shall include, but is not limited to, the following:

- Identifying rangeland resources and grazing use in proximity to the proposed projects. In coordination with the BLM, developers shall consult existing land use plans and updated inventories.

- Evaluating impacts on rangeland resources and grazing use as part of the environmental impact analysis for the project, and considering options to avoid, minimize, and/or mitigate adverse impacts in coordination with the BLM.

A.2.2.3.2 Site Characterization, Siting and Design, Construction

RG2-1 Roads shall be constructed, improved, and maintained to minimize their impact on grazing operations. Road design shall include fencing, cattle guards, and speed control and information signs where appropriate.

A.2.2.4 Design Features for Wild Horses and Burros

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on wild horses and burros from solar development identified and discussed in Section 5.4.2.1 and 5.4.2.2 of the Draft and Final Solar PEIS.

A.2.2.4.1 General

WHB1-1 Project developers shall coordinate with the BLM and other stakeholders early in the project planning process to assess and consider options to avoid, minimize, and/or mitigate impacts on wild horses and burros and their management areas.

(a) Assessing impacts on wild horses and burros and their management areas shall include, but is not limited to, the following:

- Identifying wild horses and burros and their management areas in proximity to the proposed projects. In coordination with the BLM, developers shall consult existing land use plans and updated inventories.

- Evaluating potential impacts on wild horses and burros and their management areas as part of the environmental impact analysis for the project and considering options to avoid, minimize, and/or mitigate adverse impacts in coordination with the BLM.

(b) Methods to minimize impacts on wild horses and burros and their management areas may include, but are not limited to, the following:

- Installing fencing and access control.

- Providing for movement corridors.

- Delineating open range.

- Requiring traffic management measures (e.g., vehicle speed limits).

- Ensuring access to or replacement of water sources.

- Incorporating key elements to mitigate impacts on wild horses and burros in a WEAP that is provided to all project personnel prior to entering the project work site. The WEAP shall be provided on a regular basis, covering multiple resources, to ensure the awareness of key wild horse and burro mitigation efforts of the project work site during all phases of the projects life. The base information the WEAP provides shall be reviewed and approved by the BLM prior to the issuance of a Notice to Proceed and incorporates adaptive management protocols for addressing changes over the life of the project, should they occur.

A.2.2.4.2 Site Characterization, Siting and Design, Construction

WHB2-1 Project access roads shall be sited, designed, constructed, fenced, and/or improved to minimize potential wild horse and burro collisions. Fences, or other appropriate structures, should be constructed to exclude wild

horses and burros from solar project site facilities. Water sources or access routes to water sources for horses and burros either should be excluded from the solar development area or alternate water sources or routes should be provided.

A.2.2.5 Design Features for Wildland Fire

The following design features have been identified to avoid, minimize, and/or mitigate potential fire risks that could be impacted by solar development as identified and discussed in Sections 5.4.3.1 and 5.4.3.2 of the Draft and Final Solar PEIS.

A.2.2.5.1 General

WF1-1 Project developers shall coordinate with the BLM and other appropriate fire organizations early in the project planning process to determine fire risk and methods to minimize fire risk.

(a) Identifying fire risk shall include, but is not limited to, the following:

- Assessing the potential for fire risk associated with the proposed project in coordination with the BLM and other appropriate fire organizations. Developers shall consult existing land use plans and fire management plans.

- Evaluating fire risk as part of the environmental impact analysis for the project and considering options to avoid, minimize, and/or mitigate such risk in coordination with the BLM.

(b) General methods to minimize fire risk shall include, but are not limited to, the following:

- Developing and implementing fire management measures that include providing worker training.

- Incorporating key elements to mitigate the potential for fire into a WEAP that is provided to all project personnel prior to entering the project work site. The WEAP shall be provided on a regular basis, covering multiple resources, to ensure the awareness of key fire mitigation efforts of the project work site during all phases of the project's life. The information provided in the WEAP shall be reviewed and approved by BLM prior to the issuance of a Notice to Proceed and incorporate adaptive

management protocols for addressing changes over the life of the project, should they occur.

- Incorporating inspection and monitoring measures, including adaptive management protocols, into the POD and other applicable plans to monitor and respond to fire risk during construction, operations, and decommissioning of a solar development.

A.2.2.5.2 Site Characterization, Siting and Design, Construction

WF2-1 Solar facilities shall be sited and designed to minimize fire risk.

(a) Methods to minimize fire risk may include, but are not limited to, the following:

- Siting and designing the solar facilities to ensure sufficient room for fire management within the ROW and its facilities to minimize the risk of fire moving outside the ROW and the risk of fire threatening the facility from outside.

- Consulting fire management personnel to determine actions, both active and passive (e.g., vegetation manipulation), that may minimize the need for protective responses by the BLM and state and local fire organizations.

- Developing and implementing measures to integrate vegetation management to minimize the potential to increase the frequency of wildland fires and prevent the establishment of non-native, invasive species on the solar energy facility and its transmission line and roads.

A.2.2.6 Design Features for Public Access and Recreation Impacts

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on public access and recreation from solar development identified and discussed in Sections 5.5.1 and 5.5.2 of the Draft and Final Solar PEIS.

A.2.2.6.1 General

R1-1 Project developers shall consult with the BLM in the early phases of project planning to identify public access and recreation use areas in and adjacent to a project site.

(a) Identifying public access and recreation in and adjacent to a project shall include, but is not limited to, the following:

- Considering existing public access through or around proposed solar facilities that allows for access to and use of BLM-administered public lands and non-BLM administered lands. Developers shall conduct this assessment in coordination with the BLM and consult existing land use plans, recreation management plans, etc.

- Identifying legal access to private, state, and federal lands surrounding the solar facilities to avoid creating areas that are inaccessible to the public.

- Evaluating impacts on public access and recreation as part of the environmental impact analysis for the project and considering options to avoid, minimize, and/or mitigate adverse impacts in coordination with the BLM.

(b) Methods to minimize access and recreation conflicts may include, but are not limited to, the following:

- Considering replacement of acreage lost for identified recreation opportunities, such as off-highway vehicle use.

- Considering, to the extent practicable, providing access through or around a solar energy facility to provide for adequate public access and/or recreation.

- Incorporating environmental inspection and monitoring measures into the POD and other applicable plans to monitor and respond to impacts on recreation during construction, operations, and decommissioning of a solar development, including adaptive management protocols.

A.2.2.6.2 Site Characterization, Siting and Design, Construction

R2-1 Solar facilities shall not be sited in areas of unique or important recreation resources where it has been determined that a solar facility or other such development of the land would be in direct conflict with the objectives of the relevant management plan. The BLM may determine that areas not specifically designated but that have unique or important recreation resources should also be avoided.

A.2.2.7 Design Features for Military and Civilian Aviation

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on military and civilian aviation from solar development identified and discussed in Sections 5.6.1 and 5.6.2 of the Draft and Final Solar PEIS.

A.2.2.7.1 General

MCA1-1 Project developers shall coordinate with the BLM, military personnel, and civilian airspace managers early in the project planning process to identify and minimize impacts on military and civilian airport and airspace use.

(a) Identifying impacts on military and civilian airport and airspace use shall include, but is not limited to, the following:

- Submitting plans for proposed construction of any facility that is 200 ft (~61 m) or taller and plans for other projects located in proximity to airports to the Federal Aviation Administration (FAA) to evaluate potential safety hazards.

- Consulting with the U.S. Department of Defense (DoD) to minimize and/or eliminate impacts on military operations and encouraging compatible development. This consultation will be initiated by the BLM and will include both general discussions for early planning and detailed assessments of specific proposals at the local level. The BLM will accept formal DoD submissions once they have been vetted through both the Military Departments and the DoD Siting Clearinghouse.

- Evaluating impacts on military and civil aviation as part of the environmental impact analysis for the project and considering options to avoid, minimize, and/or mitigate adverse impacts in coordination with the BLM.

A.2.2.8 Design Features for Soil Resources and Geologic Hazards

The following design features have been identified to avoid, minimize, and/or mitigate potential soil impacts and potential geologic hazards from solar development identified and discussed in Sections 5.7.1 and 5.7.2 (soil impacts) and 5.7.3 (geologic hazards) of the Draft and Final Solar PEIS.

A.2.2.8.1 General

SR1-1 Project developers shall coordinate with the BLM, and other federal, state, and local agencies early in the project planning process to assess soil erosion and geologic hazard concerns and to minimize potential impacts.

(a) Assessing soil erosion and geologic hazard concerns shall include, but is not limited to, the following:

- Identifying soil erosion and geologic hazard concerns onsite and in proximity to the proposed projects. In coordination with the BLM, developers shall consult existing land use plans, updated inventories, soil surveys, etc.

- Identifying local factors that can cause slope instability (e.g., groundwater conditions, precipitation, earthquake activity, slope angles, and the dip angles of geologic strata).

- Consulting with local federal, state, and county agencies regarding road design on the basis of local meteorological conditions, soil moisture, and erosion potential.

- Determining the potential safety and resource impacts associated with soil erosion.

- Evaluating soil erosion and geologic hazard concerns as part of the environmental impact analysis for the project and considering options to avoid, minimize, and/or mitigate adverse impacts in coordination with the BLM.

A.2.2.8.2 Site Characterization, Siting and Design, Construction

SR2-1 Solar facilities shall be sited, designed, and constructed to minimize soil erosion and geologic hazard concerns.

(a) Methods to minimize soil erosion may include, but are not limited to, the following:

- Designing structures to meet the requirements of all applicable federal, state, and county permits and building codes.

- Minimizing ground-disturbing activities.

- Preventing channel erosion from project runoff.

- Controlling culvert outlets with appropriate structures (e.g., rock lining or apron) to reduce soil erosion and scouring.

- Recontouring and revegetating project roads that are no longer needed in order to increase infiltration and reduce soil compaction.

- Considering utilizing originally excavated materials for backfill.

- Controlling project vehicle and equipment speeds to reduce dust erosion.

- Controlling water runoff and directing it to settling or rapid infiltration basins.

- Retaining sediment-laden waters from disturbed, active areas within the project through the use of barriers and sedimentation devices (e.g., berms, straw bales, sandbags, jute netting, or silt fences). Removing sediment from barriers and sedimentation devices to restore sediment-control capacity.

- Placing barriers and sedimentation devices around drainages and wetlands.

- Siting project structures and facilities to avoid disturbance in areas with existing biological soil crusts.

- Replanting project areas with native vegetation at spaced intervals to break up areas of exposed soil and reduce soil loss through wind erosion.

- Minimizing land disturbance (including crossings) in natural drainage systems and groundwater recharge zones (i.e., ephemeral washes and dry lake beds).

- Locating and constructing drainage crossing structures so as not to decrease channel stability or increase water volume or velocity.

- Providing adequate space (i.e., setbacks) between solar facilities and natural washes to preserve hydrologic function.

- Considering the use of existing roads, disturbance areas, and borrow pits before creating new infrastructure. The use of any existing infrastructure shall be analyzed in the environmental analysis for the proposed project.

- Siting, designing, and constructing new roads and walking trails consistent with the appropriate design standards and criteria, such as those described in BLM Manual 9113 and 43 CFR 8342.1. Roads and trails should follow natural land contours and hill cuts should be minimized in the project area.

- Avoiding areas with unstable slopes and soils.

- Avoiding excessive grades on roads, road embankments, ditches, and drainages during site preparation and construction.

- Considering use of special construction techniques in areas of steep slopes, erodible soil, and drainage ways.

- Considering implementing construction in stages to limit the areas of exposed and unstabilized soils.

- Reducing construction activity timeframes so that ground-disturbing activities take place over as short a timeframe as possible.

- Lessening fugitive dust emissions and site soils compaction by avoiding unpaved surfaces with construction traffic.

- Avoiding clearing and disturbing areas outside the construction zone.

- Clearly identifying construction zone boundaries on the ground (e.g., through the use of construction fencing) to minimize conflict with other resource concerns.

- Avoiding ground disturbance in areas with intact biological soil crusts and desert pavement. For cases in which impacts cannot be avoided, soil crusts should be salvaged and restored on the basis of recommendations by the BLM once construction has been completed.

- Burying electrical lines from solar collectors along existing features (e.g., roads or other paths of disturbance) to minimize the overall area of surface disturbance.

- Obtaining borrow materials from authorized and permitted sites.

- Conducting construction grading in compliance with industry practice (e.g., the American Society for Testing and Materials

[ASTM] international standard methods) and other requirements (e.g., BLM and/or local grading and construction permits).

- Using temporary stabilization devices (i.e., erosion matting blankets, or soil stabilizing agents) for areas that are not actively under construction.

- Salvaging topsoil from all excavation and construction and reapplying it to disturbed areas upon completion of construction.

- Restoring native plant communities as quickly as possible in disturbed areas through natural revegetation or by seeding and transplanting (using weed-free native grasses, forbs, and shrubs), on the basis of BLM recommendations.

- Minimizing soil-disturbing activities on wet soils.

- Performing studies to determine the effects from construction activities on the eolian processes that maintain any nearby sand dunes, if applicable.

- Incorporating environmental inspection and monitoring measures into the POD and other applicable plans to monitor and respond to impacts on soil resources during construction, operations, and decommissioning of a solar development, including adaptive management protocols.

(b) Methods to minimize geologic hazard concerns may include, but are not limited to, the following:

- Building project structures in accordance with the design-basis recommendations in the project-specific geotechnical investigation report.

- Considering special siting, design, and engineering strategies in areas that involve high seismic activity or have potential for flooding or debris flow.

A.2.2.8.3 Operations and Maintenance

SR3-1 Compliance with the conditions for soil resources and geologic hazards shall be monitored by the project developer. Consultation with the BLM shall be maintained through the operations and maintenance of the project, employing an adaptive management strategy and modifications, as necessary and approved by the BLM.

(a) Methods to maintain the soil erosion and geologic hazard design elements during operations and maintenance of the project shall include, but are not limited to, the following:

- Applying design features developed for the construction phase to similar activities during the operations phase.
- Performing routine site inspections to assess the effectiveness of maintenance requirements for erosion and sediment control systems.
- Maintaining the permanent barriers and sedimentation devices to ensure effective control.
- Regularly maintaining catch basins, roadway ditches, and culverts.
- Identifying soil erosion and geologic hazard requirements within the POD and other applicable plans.

SR3-2 Permanent stabilization of disturbed areas shall occur during final grading and landscaping of the site and be maintained through the life of the facility.

A.2.2.8.4 Reclamation and Decommissioning

SR4-1 All design features for soil erosion and geologic hazards developed for the construction phase shall be applied to similar activities undertaken during the decommissioning and reclamation phase.

SR4-2 To the extent possible, the original grade and drainage pattern shall be re-established.

SR4-3 Native plant communities in disturbed areas shall be restored by natural revegetation or by seeding and transplanting (using weed-free native grasses, forbs, and shrubs), on the basis of recommendations by the BLM, once decommissioning is completed.

A.2.2.9 Design Features for Mineral Resources

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on mineral resources from solar development identified and discussed in Sections 5.8.1 and 5.8.2 of the Draft and Final Solar PEIS.

A.2.2.9.1 General

MR1-1 Project developers shall consult with the BLM in the early phases of project planning to identify potential impacts on mineral development activities and ways to minimize potential adverse impacts.

(a) Assessing impacts on mineral resources shall include, but is not limited to, the following:

- Identifying active mining claims or mineral development activities and potential for mineral development in proximity to a proposed project. In coordination with the BLM, developers shall consult existing land use plans and updated inventories.

- Evaluating impacts on mineral development as part of the environmental impact analysis for the project and considering options to avoid, minimize, and/or mitigate adverse impacts in coordination with the BLM.

MR1-2 All solar energy development ROWs shall contain the stipulation that the BLM retains the right to issue oil and gas or geothermal leases with a stipulation of no surface occupancy within the ROW area. Upon designation, SEZs will be classified as no surface occupancy areas for oil and gas and geothermal leasing.

A.2.2.9.2 Site Characterization, Siting and Design, Construction

MR2-1 Solar development projects shall be located to minimize conflicts with valid existing mineral rights and/or ongoing mineral development.

A.2.2.10 Design Features for Water Resources

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on water resources from solar development identified and discussed in Sections 5.9.1 and 5.9.2 of the Draft and Final Solar PEIS.

A.2.2.10.1 General

The following activities will be undertaken to minimize impacts on water resources. They are to be done in coordination with the appropriate local, state, and federal regulating agencies.

WR1-1 Project developer shall control project site drainage, erosion, and sedimentation related to stormwater runoff. The project developer shall

identify site surface water runoff patterns and develop measures that prevent excessive and unnatural soil deposition and erosion throughout and downslope of the project site and project-related construction areas. This shall be implemented within a Stormwater Pollution Prevention Plan and incorporated into the POD, as appropriate.

(a) Assessing stormwater runoff concerns shall include, but is not limited to, the following:

- Conducting hydrologic analysis and modeling to define the 100-year, 24-hour rainfall for the project area and calculating projected runoff from this storm at the site.

- Demonstrating the project will not increase off-site flooding potential, and including provisions for stormwater and sediment retention on the project site.

- Demonstrating compliance with construction stormwater permitting through the EPA or state-run NPDES program (whichever applies within the state).

- Demonstrating compliance with the EPA requirement that any development larger than 20 acres (0.08 km^2) and begun after August 2011 must monitor construction discharges for turbidity concentrations.

(b) Methods to minimize stormwater runoff concerns may include, but are not limited to, the following:

- Directing runoff from parking lots, roofs, or other impervious surfaces.

- Creating or improving landscaping used for stormwater treatment to capture runoff.

- Considering reduction of impervious surfaces through the use of permeable pavement or other pervious surfaces.

- Maintaining natural drainages and pre-project hydrographs for the project ROW to the extent practicable.

- Maintaining pre-development flood hydrograph for all storms up to and including the 100-year rainfall event.

- Incorporating environmental inspection and monitoring measures into the POD and other applicable plans to monitor

and respond to impacts from stormwater runoff during construction, operations, and decommissioning of a solar development, including adaptive management protocols.

WR1-2 Project developers shall conduct hydrologic study (or studies) that demonstrate a clear understanding of the local surface water and groundwater hydrology.

(a) Assessing surface water and groundwater hydrology shall include, but is not limited to, the following:

- Determining the relationship of the project site hydrologic basin to the basins in the region.
- Identifying surface water bodies within the watershed of SEZs or individual projects (including rivers, streams, ephemeral washes/drainages, lakes, wetlands, playas, and floodplains) and identifying the 100-year floodplain of any surface water feature on the site.
- Identifying applicable groundwater aquifers.
- Quantifying physical characteristics of surface water features, such as streamflow rates, stream cross sections, channel routings, seasonal flow rates.
- Quantifying physical characteristics of the groundwater aquifer, such as physical dimensions of the aquifer, sediment characteristics, confined/unconfined conditions, hydraulic conductivity, and transmissivity distribution of the aquifer.
- Quantifying the regional climate, including seasonal and long-term information on temperatures, precipitation, evaporation, and evapotranspiration.
- Quantifying the sustainable yield of surface waters and groundwater available to the project.
- Consulting with the U.S. Army Corps of Engineers (USACE) regarding the siting of solar energy generating facilities in relation to hydrological features that have the potential to be subject to USACE jurisdiction.

WR1-3 Project developers shall coordinate with the BLM and other federal, state, and local agencies early in the planning process in order to identify

and minimize water use for the solar project, and to secure water rights needed to meet project water needs.

(a) Assessing water use shall include, but is not limited to, the following:

- Quantifying water use requirements for project construction, operation, and decommissioning.

- Meeting potable water supply standards of federal, state, and local water quality authorities (e.g., Sections 303 and 304 of the CWA).

- Identifying wastewater treatment measures and new or expanded facilities, if any, to be included as part of the facility's National Pollutant Discharge Elimination System (NPDES) permit.

(b) Methods for minimizing water use may include, but are not limited to, the following:

- Utilizing appropriate water sources with respect to management practices for maintaining aquatic, riparian, and other water-dependent resources.

- Considering water conservation measures related to solar energy technology water needs to reduce project water requirements (i.e., use dry cooling, use recycled or impaired water).

- Incorporating environmental inspection and monitoring measures into the POD and other applicable plans to monitor water use during construction, operations, and decommissioning of the solar development, including adaptive management protocols.

WR1-4 Project developers shall avoid and/or minimize impacts on existing surface water features, including streams, lakes, wetlands, floodplains, intermittent/ephemeral streams, and playas (any unavoidable impacts would be minimized or mitigated) and in nearby regions resulting from the development in accordance with the following:

- All sections of the Clean Water Act (CWA), including Sections 401, 402, and 404 addressing licensing and permitting issues;

- Executive Orders (E.O.s) 11988 and 11990 of May 24, 1977, regarding floodplain and wetland management: E.O. 11988,

"Floodplain Management" (*Federal Register*, Volume 42, page 26951 [42 FR 26951]), and E.O. 11990, "Protection of Wetlands" (42 FR 26961);

- U.S. Environmental Protection Agency (EPA) stormwater management guidelines and applicable state and local guidelines;

- Include submittal of a jurisdictional delineation for consultation with the USACE, in accordance with the 1987 wetlands delineation manual and appropriate regional supplement; avoidance, minimization and compensation proposals;

- USACE permit, nationwide verification, or other approved jurisdiction. This includes identification of a Least Environmentally Damaging Practicable Alternative (LEDPA) within the environmental analysis. The USACE permit, nationwide verification, or approved jurisdiction letter shall be provided to the BLM prior to a decision;

- National Wild and Scenic Rivers System (Public Law 90-542; 16 *United States Code* [U.S.C.] 1271 et seq.); and

- Required CWA Section 303(d) identification of impaired surface water bodies.

A.2.2.10.2 Site Characterization, Siting and Design, Construction

WR2-1 Project developers shall avoid, minimize, and mitigate impacts on groundwater and surface water resources in accordance with the laws and policies above.

(a) Methods to minimize impacts on surface water and ground water resources may include, but are not limited to, the following:

- Reclaiming disturbed soils as quickly as possible.

- Preventing the release of project waste materials into stormwater discharges.

- Avoiding impacts on sole source aquifers according to EPA guidelines.

- Developing measures to prevent potential groundwater and surface water contamination and incorporating them into the Spill Prevention and Emergency Response Plan and POD, as appropriate.

- Minimizing land disturbance in ephemeral washes and dry lakebeds. Stormwater facilities shall be designed to route flow through or around the facility using existing washes when feasible, instead of concrete-lined channels.

- Designing culverts and water conveyances to comply with BLM, state, and local standards, or to accommodate the runoff of a 100-year storm, whichever is larger.

- Designing stormwater retention and/or infiltration and treatment systems for storm events up to and including the 100-year storm event.

- Utilizing geotextile matting to stabilize disturbed channels and streambanks.

- Diverting work-site runoff from entering disturbed streams using earth dikes, swales, and lined ditches.

- Placing sediment control devices so that sediment-laden water can pond, thus allowing sediment to settle out.

- Considering placement of check dams (i.e., small barriers constructed of rock, gravel bags, sandbags, fiber rolls, or reusable products) across a swale or drainage ditch to reduce the velocity of flowing water.

- Considering special construction techniques in areas of erodible soil, alluvial fans, and stream channel/wash crossings.

- Backfilling foundations and trenches with originally excavated material.

- Disposing of excess excavated material according to state and federal laws.

- Maintaining drilling fluids or cuttings in a manner so as not to contact aquatic habitats. Temporary impoundments for storing drilling fluids and cuttings shall be lined to minimize the infiltration of runoff into groundwater or surface water.

- Avoiding washing equipment or vehicles in streams and wetlands.

- Constructing entry and exit pits in work areas to trap sediments from vehicles so they do not enter streams at stream crossings.

- Providing for periodic removal of wastewater generated in association with sanitary facilities by a licensed hauler.

- Avoiding the creation of hydrologic conduits between two aquifers.

- Using herbicides and pesticides within the framework of BLM and DOI policies and standard operating procedures, to include the use of only EPA-registered pesticides/herbicides that also comply with state and local regulations.

- Transporting, storing, managing, and disposing of hazardous materials and vehicle/equipment fuels in accordance with accepted best management practices (BMPs) and in compliance with all applicable regulations, and where applicable, the SWPPP.

A.2.2.10.3 Operations and Maintenance

WR3-1 Compliance with the terms and conditions for water resource mitigation shall be monitored by the project developer. The developer shall consult with the BLM through operations and maintenance of the project, employing an adaptive management strategy and modifications, as necessary and approved by the BLM.

(a) Maintaining the water resource design elements during operations and maintenance of the project shall include, but not be limited to, the following:

- Monitoring water quantity and quality in areas adjacent to or downstream from development areas through the life of the project to ensure that water flows and water quality are protected.

- Treating of sanitary and industrial wastewater either on-site or off-site to comply with federal, state, and local regulations. Any discharges to surface waters would require NPDES permitting. Any storage or treatment of wastewater on-site must use proper lining of holding ponds and tanks to prevent leaks.

- Implementing monitoring using adaptive management strategies to ensure that long-term water use during operations does not contribute to long-term decline of groundwater levels or surface water flows and volumes.

A.2.2.10.4 Reclamation and Decommissioning

WR4-1 Reclamation of the project site shall begin immediately after decommissioning to reduce the likelihood of water resource impacts from project activities. Developers shall coordinate with the BLM in advance of interim/final reclamation to have the BLM or other designated resource specialists on-site during reclamation to work on implementing water resource requirements and BMPs.

(a) Methods for minimizing water resource impacts associated with reclamation and decommissioning activities may include, but are not limited to, the following:

- Restoring the project area to predevelopment water conditions or to the extent acceptable by the BLM.
- Considering contouring soil borrow areas, cut-and-fill slopes, berms, water bars, and other disturbed areas to approximate naturally occurring slopes.
- Feathering edges of vegetation to reduce form and line contrasts with the existing landscapes.
- Salvaging and reapplying topsoil from all decommissioning activities during final reclamation.
- Continuing groundwater and surface water monitoring activities.

A.2.2.11 Design Features for Ecological Resources

Many design features are similar for different types of ecological resources (plant communities and habitats, wildlife, aquatic resources, and special status species[2]). Design

[2] Special status species include the following types of species: (1) species listed as threatened or endangered under the Endangered Species Act (ESA); (2) species that are proposed for listing, under review, or candidates for listing under the ESA; (3) species that are listed as threatened or endangered by the state or are identified as fully protected by the state; (4) species that are listed by the BLM as sensitive; and (5) species that have been ranked S1 or S2 by the state or as species of concern by the state or U.S. Fish and Wildlife Service (USFWS). Note that some of the categories of species included here do not fit BLM's definition of special status species as defined in BLM Manual 6840. These species are included here to ensure broad consideration of species that may be most vulnerable to impacts.

features for avoiding or minimizing impacts on all these types of ecological resources in general and during the various project phases are presented in the following sections. They were identified to avoid, reduce, and/or mitigate impacts on ecological resources from solar development identified and discussed in Section 5.10 of the Draft and Final Solar PEIS.

A.2.2.11.1 General

ER1-1 Project developers shall consult with the BLM and other federal, state, and local agencies, in the early phases of project planning to help ensure compliance with federal regulations which address the protection of fish, wildlife, and plant resources, with appropriate federal, state, and local agencies.

(a) Assessing compliance with pertinent regulations for ecological resources shall include, but is not limited to, the following:

- Developing in coordination with the BLM and U.S. Fish and Wildlife Service (USFWS) strategies for complying with regulatory requirements of the Bald and Golden Eagle Act.

- Developing in coordination with appropriate federal and state agencies (e.g., BLM, USFWS, and state resource management agencies) measures to protect birds (including migratory species protected under the Migratory Bird Treaty Act [MBTA]).

- Contacting appropriate agencies (e.g., BLM, USFWS, and state resource management agencies) early in the project planning process to identify potentially sensitive ecological resources such as aquatic habitats, wetland habitats, unique biological communities, crucial wildlife habitats, and special status species locations and habitats located within or in the vicinity of the areas occupied by the solar energy facility and associated access roads and ROWs.

- Consulting with the USACE regarding the siting of solar energy generating facilities and energy transmission infrastructure in relation to hydrological features that have the potential to be subject to USACE jurisdiction.

- Considering restrictions on timing and duration of activities developed in coordination with the BLM, USFWS, and other appropriate agencies to minimize impacts from project activities on nesting birds (especially passerines and listed species).

- Considering recommendations contained in *Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocol and Other Recommendations in Support of Golden Eagle Management and Permit Issuance*.

- Adhering to instruction Memorandum 2010-156, the *Bald and Golden Eagle Protection Act – Golden Eagle National Environmental Policy Act and Avian Protection Plan Guidance for Renewable Energy* until programmatic permits from the USFWS are available. The analysis of potential impacts on, and mitigation for, golden eagles shall be made in coordination with the USFWS.

- Avoiding take of golden eagles and other raptors. Mitigation regarding the golden eagle shall be developed in consultation with the USFWS and appropriate state natural resource agencies. A permit may be required under the Bald and Golden Eagle Protection Act.

- Discussing potential impacts on sensitive habitats resulting from operation of vehicles and construction of structures, including transmission lines, within the environmental analysis.

(b) Methods to minimize regulatory conflicts for ecological resources may include, but are not limited to, the following:

- Including submittal of a jurisdictional delineation for consultation with the USACE, in accordance with the 1987 wetlands delineation manual and appropriate regional supplement; avoidance, minimization and compensation proposals.

- Identifying a Least Environmentally Damaging Practicable Alternative (LEDPA) and analyzing within the environmental analysis. A USACE permit, nationwide verification, or approved jurisdiction letter shall be provided to the BLM prior to a decision.

- Developing measures to ensure protection of raptors in coordination with appropriate federal and state agencies (e.g., BLM, USFWS, and state resource management agencies).

- Developing measures to ensure protection of bats in coordination with appropriate federal and state agencies (e.g., BLM, USFWS, and state resource agencies).

- Developing measures to ensure mitigation and monitoring of impacts on special status species in coordination with appropriate federal and state agencies (e.g., BLM, USFWS, and state resource management agencies).

- Consulting with the USFWS upon discovery of federally listed threatened and endangered species during any phase of the project. An appropriate course of action shall be determined to avoid, minimize, or mitigate impacts. All applicable terms and conditions and conservation measures listed in the programmatic Biological Opinion, issued by the USFWS, shall be followed.

- Informing project personnel that only qualified biologists are permitted to handle listed species according to specialized protocols approved by the USFWS.

- Considering plants, wildlife, and their habitats in the facility's Dust Abatement Plan.

- Limiting herbicide use to non-persistent, immobile substances. Only herbicides with low toxicity to wildlife and non-target native plant species shall be used, as determined in consultation with the USFWS. Section 5.10.2.1.5 discusses the potential impacts of herbicides on wildlife. All herbicides shall be applied in a manner consistent with their label requirements and in accordance with guidance provided in the Final Solar PEIS on vegetation treatments using herbicides. Prior to application of herbicide treatments, a qualified person, such as a biologist, shall conduct surveys of bird nests and of special status species to identify the special measures or BMPs necessary to avoid and minimize impacts on migratory birds and special status species.

- Developing a SWPPP for each project that includes avoids, to the extent practicable, changes in surface water or groundwater quality (e.g., chemical contamination, increased salinity, increased temperature, decreased dissolved oxygen, and increased sediment loads) or flow that result in the alteration of terrestrial plant communities or communities in wetlands, springs, seeps, intermittent streams, perennial streams, and riparian areas (including the alteration of cover and community structure, species composition, and diversity) off the project site.

- Utilizing block or check valves on both sides of the waterway or habitat to minimize product release from pipelines that transport hazardous liquids (e.g., oils) that pass through aquatic or other

habitats. Such pipelines shall be constructed of double-walled pipe at river crossings.

- Considering compensatory mitigation and monitoring of significant direct, indirect, and cumulative impacts on, and loss of habitat for, special status plant and animal species.

- Incorporating key elements on the identification and protection of ecological resources (especially for special status species), including knowledge of required design features, in instructions to all personnel. Incorporate the knowledge into a WEAP that is provided to all project personnel prior to entering the project work site. The WEAP shall be provided on a regular basis, so as to ensure the continued ecological awareness of the project work site during all phases of the project's life. The base information the WEAP provides shall be reviewed and approved by BLM prior to the issuance of a Notice to Proceed and incorporate adaptive management protocols for addressing ecological changes over the life of the project, should they occur.

- Planning for vegetation management that is consistent with applicable regulations and agency policies for the control of noxious weeds and invasive plant species (Sections 5.10.1.1.2 and 5.10.1.1.4 discuss the need for local and regional native plants in revegetation and restoration).

- Developing measures for fire management and protection that minimize the potential for a human- or facility-caused fire to affect ecological resources and that respond to natural fire situations (Section 5.10.1.1.2-3 discusses the potential impacts of fire on native plant communities).

- Developing measures to investigate the possibility of revegetating parts of the solar array area.

- Designating a qualified biologist who will be responsible for overseeing compliance with all design features related to the protection of ecological resources throughout all project phases, particularly in areas requiring avoidance or containing sensitive biological resources. This person shall be reviewed and approved by the USFWS and the BLM for designation as a qualified biologist.

- Conducting pre-construction surveys, in coordination with BLM, USFWS, and state agency statutes, programs, and policies.

- Conducting seasonally appropriate inspections by a qualified biologist or team of biologists to ensure that important or sensitive species or habitats are not present in or near project areas. Attendees at the inspections may include appropriate federal agency representatives, state natural resource agencies, and construction contractors, as appropriate. Habitats or locations to be avoided shall be clearly marked.

A.2.2.11.2 Site Characterization, Siting and Design, Construction

ER2-1 Solar facilities shall be sited and designed, and constructed to minimize impacts on ecological resources.

(a) Methods to minimize impacts on ecological resources may include, but are not limited to the following:

- Siting and designing projects to avoid and minimize direct and indirect impacts on important, sensitive, or unique habitats in the project vicinity, including, but not limited to waters of the United States, wetlands (both jurisdictional and non-jurisdictional), springs, seeps, streams (ephemeral, intermittent, and perennial), 100-year floodplains, ponds and other aquatic habitats, riparian habitat, remnant vegetation associations, rare or unique biological communities, crucial wildlife habitats, and habitats supporting special status species populations (including designated and proposed critical habitat).

- Avoiding siting projects in designated critical habitat, ACECs, or other specially designated areas that are identified as necessary for special status species and habitat conservation.

- Considering siting projects on previously disturbed lands in close proximity to energy load centers to avoid and minimize impacts on remote, undisturbed lands.

- Designing project facilities to reduce the number of stream crossings within a particular stream or watershed (e.g., access roads and utilities could share common ROWs, where feasible), and locating facilities in pre-disturbed areas to reduce potential for habitat fragmentation.

- Preventing establishment and spread of invasive species and noxious weeds within the ROW and in associated areas where there is ground surface disturbance or vegetation cutting. Developers should consider siting project facilities and

activities, including associated roads and utility corridors, out of occupied habitats of special status animal species.

- Determining, in coordination with appropriate federal and state agencies, the translocation of special status species, including the steps to implement the translocation and the follow-up monitoring of populations in the receptor locations, as determined in coordination with the appropriate federal and state agencies. Developers should plan for translocation of special status species when appropriate.

- Considering the salvage of Joshua trees (*Yucca Brevifolia*), other Yucca species, and most cactus species in coordination with the local BLM field office.

- Considering conducting interim and final restoration activities as soon as possible after development activities are completed in order to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.

- Implementing revegetation, soil stabilization, and erosion reduction measures to ensure temporary use areas are restored.

- Conducting a nesting bird survey or other necessary survey for nesting birds. If active nests are detected, the nest area shall be flagged, and no activity shall take place near the nest (at a distance determined by BLM in coordination with the USFWS and/or appropriate state agencies), or until the appropriate agencies agree that construction can proceed with the incorporation of agreed-upon monitoring measures.

- Siting and designing project activities away from habitats occupied by special status animal species. Developers should consider establishing buffers around sensitive habitats to prevent destructive impacts associated with project activities (e.g., identified in the land use plan or substantiated by best available information or science in consultation with the BLM).

- To the extent practicable, avoiding entry into aquatic habitats, such as streams and springs, during site characterization activities until surveys by qualified biologists have evaluated the potential for unique flora and fauna to be present.

- Planning for and developing measures that identify management practices to minimize increases in nuisance animals and pests in the project area. The plans should identify nuisance and pest

species that are likely to occur in the area, risks associated with these species, species-specific control measures, and monitoring requirements.

- Designing solar facilities to avoid, minimize, and mitigate impacts on wetlands, waters of the United States, and other special aquatic sites.

- Locating and designing individual project facilities to minimize disruption of animal movement patterns and connectivity of habitats. Section 5.10.2.1.2 discusses the potential impacts of habitat loss and fragmentation on wildlife.

- Avoiding surface water or groundwater withdrawals that adversely affect sensitive habitats (e.g., aquatic, wetland, playa, microphyll woodland, and riparian habitats) and habitats occupied by special status species.

- Designing water intake facilities to minimize the potential for aquatic organisms from surface waters to be entrained in cooling water systems.

- Demonstrating, through hydrologic modeling, that the withdrawals required for the project are not going to affect groundwater discharges that support special status species or their habitats.

- Considering the use of fencing and netting for evaporation ponds to prevent their use by wildlife.

- To the extent practicable, locating meteorological towers and solar sensors, soil borings and wells, and travel routes to avoid sensitive habitats or areas where wildlife (e.g., sage-grouse) is known to be sensitive to human activities.

- To the extent practicable, avoiding siting solar power facilities near open water or other areas that are known to attract large numbers of birds.

- To the extent practicable, placing tall structures, such as meteorological towers and solar power towers, to avoid known flight paths of birds and bats.

- Implementing current guidelines and methodologies in the design and analysis of proposed transmission facilities in order

to minimize the potential for raptors and other birds to collide or be electrocuted by them.

- Placing mechanisms to visually warn birds (permanent markers or bird flight diverters) on transmission lines at regular intervals to prevent birds from colliding with the lines.

- Designing transmission line support structures and other facility structures to discourage use by raptors for perching or nesting (e.g., by using monopoles rather than lattice support structures or by use of anti-perching devices).

- Considering spanning important or sensitive habitats with transmission line conductors within the limits of standard structure design.

- Using low-water crossings (fords) during the driest time of the year. Developers should consider using rocked approaches to fords and returning the crossing to pre-existing stream channel conditions after the need for a low-water ford has passed.

- Employing noise reduction devices (e.g., mufflers) to minimize the impacts on wildlife and special status species populations. Explosives shall be used only within specified times and at specified distances from sensitive wildlife or surface waters as established by the BLM or other federal and state agencies.

- Minimizing the number of areas where wildlife could hide or be trapped (e.g., open sheds, pits, uncovered basins, and laydown areas). Movement of a discovered special status species that is hidden or trapped is prohibited. If necessary, the animal should be moved only to remove the animal from the path of harmful activity, until the animal can escape.

- Implementing measures for proper trash removal and storage, such as using secured containers and periodic emptying, on the project site to reduce attractive opportunistic species, such as common ravens, coyotes, and feral cats and dogs.

- Constructing, improving, and maintaining access roads to minimize potential wildlife/vehicle collisions and facilitate wildlife movement through the project area.

- Limiting project vehicle speeds and using shuttle vans and carpooling in areas occupied by special status animal species. Traffic shall yield to wildlife, allowing safe road crossing.

- Utilizing existing access roads, utility corridors, and other infrastructure to the maximum extent feasible.

- Locating staging and parking areas within the site of the utility-scale solar energy facility to minimize habitat disturbance.

- Considering rolled and compacted on-site construction access routes to allow trucks and equipment to access construction locations.

- Minimizing vehicle use off of access roads and foot traffic through undisturbed areas.

- Constructing fences (as practicable) to exclude livestock and wildlife from project facilities.

- Prohibiting project personnel from bringing firearms and pets to project sites.

- Placing food refuse and other garbage in closed containers so it is not available to scavengers.

- Reducing the collection, harassment, or disturbance of plants, wildlife, and their habitats (particularly special status species) through employee and contractor education about applicable state and federal laws.

- Advising personnel to minimize stopping and exiting their vehicles in the winter ranges of large game while there is snow on the ground.

- Coordinating with BLM and appropriate project personnel to handle unreasonable traffic delays caused by wildlife in roads. Utilizing appropriate personnel to move live, injured, or dead wildlife off roads, ROWs, or the project site.

- Reporting any vehicle-wildlife collisions. Observations of potential wildlife problems, including wildlife mortality, shall be immediately reported to the BLM or other appropriate agency authorized officer.

- Considering road closures or other travel modifications (e.g., lower speed limits, no foot travel) during crucial periods (e.g., extreme winter conditions, calving/fawning seasons, raptor nesting).

- Conducting pre-construction surveys by qualified personnel, such as a qualified biologist, in areas with potential to adversely affect special status species (Section 5.10.4.1.1) and utilizing approved survey techniques or established species-specific survey protocols to determine the presence of special status species in the project area.

- Considering the number of qualified biological monitors (as determined by the federal authorizing agency and USFWS) to be on-site during initial site preparation and during the construction period to monitor, capture, and relocate animals that could be harmed and are unable to leave the site on their own.

- Relocating wildlife found in harm's way from the area of the activity. Qualified personnel shall be required to relocate some animals such as rattlesnakes.

- Establishing a controlled inspection and cleaning area to visually inspect construction equipment arriving at the project area and to remove and collect seeds that may be adhering to tires and other equipment surfaces.

- To the extent practicable, avoiding placement of transmission towers within aquatic and wetland habitats, or other sensitive habitats such as riparian habitats. If towers must be placed within these habitats, they shall be designed and installed to not impede flows or fish passage.

- Designing necessary stream crossings to provide in-stream conditions that allow for and maintain uninterrupted movement and safe passage of fish during all project periods.

- Considering cutting trees in stream buffers that are able to grow into a transmission line conductor clearance zone within 3 to 4 years.

- Considering the use of helicopters where access roads do not exist or where access roads could not be constructed without significantly impacting habitats.

A.2.2.11.3 Operations and Maintenance

ER3-1 The developer shall manage vegetation utilizing the principles of integrated pest management, including biological controls to prevent the

spread of invasive species, per the *Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States,* and the *National Invasive Species Management Plan, 2009*. Consultation with the BLM shall be maintained through operations and maintenance of the project, employing an adaptive management strategy and modifications, as necessary and approved by the BLM.

(a) Methods to manage vegetation, including controlling for invasive species, during operations and maintenance of the project may include, but are not limited to, the following:

- Using certified weed-free seed and mulching.
- Cleaning vehicles to avoid introducing invasive weeds.
- Educating project personnel on weed identification, the manner in which weeds spread, and methods for treating infestations.
- Considering periodic monitoring, reporting, and immediate eradication of noxious weed or invasive species occurring within all managed areas.
- Limiting vegetation maintenance and performing maintenance mechanically rather than with herbicides.
- Considering retaining short (i.e., less than 7-in. [18-cm] tall) native species during maintenance and operation activities.
- Reducing risk of non-native and nuisance aquatic species introductions. Developers should decontaminate equipment used in surface water, especially equipment used to convey water (i.e., pumps).
- Monitoring for and eradicating invasive species.
- Reestablishing vegetation within temporarily disturbed areas immediately following the completion of construction activities.
- Focusing revegetation efforts on the establishment of native plant communities similar to those present in the vicinity of the project site. Considering dominant native species within the plant communities that exist in adjacent areas and have similar soil conditions for revegetation.
- Considering post-translocation surveys for target species (especially if the target species are special status species) and releasing individuals to protected off-site locations as approved by federal and state agencies.

ER3-2 The developer shall, in consultation with the BLM, manage projects so as to minimize impacts on ecological resources during operations and maintenance of the project, employing an adaptive management strategy and modifications, as necessary and approved by the BLM.

(a) Methods to minimize impacts on ecological resources during operations and maintenance of the project shall include, but are not limited to, the following:

- Monitoring for increase in predation of special status species (e.g., desert tortoise, Utah prairie dog, and greater sage-grouse) from ravens and other species that are attracted to developed areas and use tall structures opportunistically to spot vulnerable prey.

- Turning off all unnecessary lighting at night to limit attracting wildlife, particularly migratory birds.

(b) Other methods for maintaining compliance with ecological resource design elements during operations and maintenance of the project may include, but are not limited to, the following:

- Monitoring for and reporting bird mortality species (e.g., raptors) that are associated with power lines to the BLM and the USFWS.

- Monitoring for the effects of groundwater withdrawals on plant communities.

- Monitoring unavoidable impacts on wetlands and waters of the United States.

- Removing raptor nests only if the birds are not actively using the nest.

- Considering relocating nests to nesting platforms. Reporting on relocated or destroyed nests to the appropriate federal and/or state agencies.

- Coordinating with the USFWS and BLM project personnel in the event that a raptor nest is located on a transmission line support structure.

- Removing raven nests only when inactive (i.e., no eggs or young); if removal is otherwise necessary, an MBTA take

permit from the USFWS is required. The removal of raven nests may be addressed in the minimization measures that incorporate the most current USFWS guidance (e.g., FONSI, *Implementation of a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise*, *2008*).

- Considering trench breakers and/or sealing the trench bottom to maintain the original wetland hydrology where a pipeline trench drains a wetland.

- Minimizing removal of deadfall or overhanging vegetation in streams for crossings.

- Installing fish screens on cooling water intakes to limit the potential for impingement impacts on organisms in surface water sources used for cooling water.

- Maintaining areas left in a natural condition during construction (e.g., wildlife crossings) in as natural a condition as possible within safety and operational constraints.

- Avoiding use of guy wires to minimize impacts on birds and bats. If guy wires are necessary, permanent markers (e.g., bird flight diverters) shall be used to increase their visibility.

- Maintaining native vegetation cover and soils and minimizing grading.

- Monitoring unavoidable impacts on wetlands and waters of the United States.

- Instructing personnel to avoid harassment and disturbance of local plants and wildlife.

- Informing personnel of the potential for wildlife interactions around facility structures.

A.2.2.11.4 Reclamation and Decommissioning

ER4-1 Reclamation of the construction and project site shall begin immediately after decommissioning to reduce the likelihood of ecological resource impacts in disturbed areas as quickly as possible.

(a) Addressing ecological resource impacts during reclamation and decommissioning shall include, but is not limited to, the following:

- Applying design features developed for the construction phase to similar activities during the decommissioning and reclamation phase.

- Developing and implementing a Decommissioning and Site Reclamation Plan specific to the project, approved by the BLM in consultation with appropriate agencies, that incorporates adaptive management strategies.

- Using weed-free seed mixes of native shrubs, grasses, and forbs of local sources where available, as required in the Decommissioning and Site Reclamation Plan.

- Developing and implementing monitoring measures to ensure successful reclamation per the Decommissioning and Site Reclamation Plan.

(b) Other methods to minimize ecological resource impacts during reclamation and decommissioning may include, but are not limited to, the following:

- Lightly raking and/or ripping and reseeding with seeds from low-stature plant species collected from the immediate vicinity in disturbed areas.

- Reclaiming access roads when they are no longer needed, considering seasonal restrictions.

- Filling or grading holes and ruts created by the removal of structures and access roads.

- Considering maximizing area reclaimed during solar energy operations to minimize habitat loss and fragmentation.

- Maintaining a clean and orderly worksite during and after decommissioning to ensure land is clear of debris.

- Planning to return land surfaces to pre-development contours immediately following decommissioning.

- Expediting the reestablishment of vegetation for site stabilization.

- Continuing vegetation reestablishment efforts until all success criteria have been met, as identified within the Decommissioning and Site Reclamation Plan.

- Focusing revegetation on the establishment of native plant communities similar to those present in the vicinity of the project site. Considering dominant native species within the plant communities that exist in adjacent areas and have similar soil conditions for revegetation.

- Leaving the facility fencing in place for several years, or replacing it with new exclusion fencing, to assist reclamation (e.g., the fence could preclude large mammals and vehicles from disturbing revegetation efforts). Shorter times for maintaining fencing may be appropriate in cases where the likelihood of disturbance by cattle and wildlife is low.

A.2.2.12 Design Features for Air Quality and Climate

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on ambient air quality and climate from solar development that were identified and discussed in Sections 5.11.1 and 5.11.2 of the Draft and Final Solar PEIS.

A.2.2.12.1 General

AQC1-1 Project developers shall consult with the BLM in the early phases of project planning to help determine the potential conformance to air quality and other potential constraints.

(a) Assessing conformance to air quality and other related constraints shall include, but is not limited to, the following:

- Identifying air quality and other related constraints associated with the proposed project site. In coordination with BLM, the appropriate state and local air regulatory authorities shall be consulted to identify air quality and related constraints and requirements.

- Determining any applicable federal, state, and local laws and regulations related to air quality.

- Considering effects on particulate matter PM_{10} and $PM_{2.5}$ from the solar energy project and its facilities.

- Evaluating potential contributions to air quality impacts as part of the environmental impact analysis for the project and considering options to avoid, minimize and/or mitigate adverse impacts in coordination with the BLM.

A.2.2.12.2 Site Characterization, Siting and Design, Construction

AQC2-1 Solar facilities shall be sited and designed, and constructed to minimize impacts on air quality.

(a) Methods to minimize air quality impacts shall include, but are not limited to, the following:

- Using equipment that meets emission standards specified in the state code of regulations and meets the applicable U.S. EPA (EPA) Tier 3 and Tier 4 emissions requirements.

- Preparing a Dust Abatement Plan for the solar facilities that considers multiple methods for dust suppressant (i.e., water, paving, gravel, and/or regulation-compliant palliatives).

(b) Other methods to minimize air quality impacts and related constraints may include, but are not limited to, the following:

- Considering surfacing access roads with aggregate that is hard enough that vehicles cannot crush it.

- Managing unpaved roads, disturbed areas (e.g., areas of scraping, excavation, backfilling, grading, and compacting), and loose materials generated during project activities as frequently as necessary to effectively minimize fugitive dust generation.

- Using machinery that has air-emission-control devices as required by federal, state, and local regulations or ordinances.

- Limiting travel to stabilized roads.

- Considering paving main access road to the main power block and the main maintenance building.

- Enforcing posted speed limits (e.g., 10 mph [16 km/hour]) within the construction site to minimize airborne fugitive dust.

- Covering vehicles that transport loose materials as they travel on public roads, using dust suppressants on truck loads, and keeping loads below the freeboard of the truck bed.

- Installing wind fences around disturbed areas that could affect the area beyond the site boundaries (e.g., nearby residences).

- Suspending soil disturbance activities and travel on unpaved roads during periods of high winds. Site-specific wind speed thresholds shall be determined on the basis of soil properties determined during site characterization.

- Utilizing compatible native vegetative plantings to limit dust generation from stockpiles that will be inactive for a relatively long period.

- To the extent practicable, avoiding chemical dust suppressants that emit volatile organic compounds within or near ozone nonattainment areas.

- Considering use of ultra-low sulfur diesel with a sulfur content of 15 parts per million (ppm) or less for project vehicles.

- Limiting the idling time of equipment to no more than 5 minutes, unless idling must be maintained for proper operation (e.g., drilling, hoisting, and trenching).

- Minimizing use of dust palliatives in areas of close proximity to sensitive soil and streams.

- Accessing transmission lines from public roads and designated routes to minimize fugitive dust emissions.

- Minimizing on-site vehicle use and requiring routine preventive maintenance, including tune-ups to meet the manufacturer's specifications, to ensure efficient combustion and minimal emissions.

- Encouraging use of newer and cleaner equipment that meets more stringent emission controls.

- Limiting access to the construction site and staging areas to authorized vehicles only through the designated treated roads.

- Staging construction to limit the exposed areas at any time.

- Considering inspection and cleaning of tires of all construction-related vehicles to ensure they are free of dirt before they enter paved public roadways.

- Cleaning up visible trackout or runoff dirt on public roadways resulting from the construction site (e.g., street vacuum/sweeping).

- Salvaging topsoil from all excavations and construction activities during reclamation or interim reclamation and reapplying to construction areas not needed for facility operation as soon as activities in that area have ceased.

- Considering atmospheric conditions when planning construction activities to minimize dust.

- To the extent practicable, avoiding ground disturbance from construction-related activities in areas with intact biological soil crusts and desert pavement. Developers should salvage soil crusts, for restoration, on the basis of recommendations by the BLM once construction has been completed.

- Incorporating environmental inspection and monitoring measures into the POD and other relevant plans to monitor and respond to air quality during construction, operations, and decommissioning of a solar development, including adaptive management protocols.

A.2.2.12.3 Operations and Maintenance

AQC3-1 Compliance with the terms and conditions for air quality shall be monitored by the project developer. Consultation with BLM shall be maintained through operations and maintenance of the project, employing an adaptive management strategy and modifications, as necessary and approved by the BLM.

(a) Methods for maintaining compliance with the terms and conditions for air quality during operations and maintenance shall include, but are not limited to, the following:

- Monitoring and treating areas that have been graded, scraped, bladed, compacted, or denuded of vegetation ahead of actual construction/assembly.

(b) Other methods to maintain compliance with the terms and conditions for air quality during operations and maintenance may include, but are not limited to, the following:

- Reapplying palliatives or water as necessary for effective fugitive dust management.

- Considering use of design features for portions of facilities maintained to be free of vegetation during operations, and use of the dust control design features that were listed above under AQC2-1 to limit fugitive dust emissions during the construction phase to minimize fugitive dust emissions from bare surfaces and unpaved access roads.

- Ensuring compliance of all combustion sources with state emission standards (e.g., best available control technology requirements).

A.2.2.12.4 Reclamation and Decommissioning

AQC4-1 Reclamation of the site shall incorporate the design features listed above for construction under AQC2-1 to reduce the likelihood of air quality impacts associated decommissioning.

A.2.2.13 Design Features for Visual Resources

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on visual resources from solar development identified and discussed in Section 5.12.3 of the Draft and Final Solar PEIS.

A.2.2.13.1 General

VR1-1 Project developers shall consult with the BLM in the early phases of project planning to help determine the proposed project's potential conformance to VRM class designations and other potential constraints, thus avoiding costly unforeseen planning implications and re-design.

(a) Assessing conformance to VRM class designations and identifying visual resource conflicts shall include, but is not limited to, the following:

- Consulting with the appropriate BLM field office for VRM class designations and associated management objectives during the

early phases of project planning, including those related to project site selection, planning, and design. The BLM visual resource inventory (VRI) class values—including those for scenic quality, sensitivity, and distance zones—shall also be factored into the project planning, design, and decision making.

- Analyzing how the visual values influence project design and how the impacts on these values will be minimized through consideration for the proposed project location and its relationship to the surrounding viewshed.

- Including a qualified professional, such as a landscape architect, with demonstrated experience of the BLM's VRM policies and procedures as part of the developer's and the BLM's respective planning teams, to evaluate visual resource issues as project siting options are considered.

- Consulting with the locally based public to provide input on identifying important visual resources in the project area and on the siting and design process. The public shall be involved and informed about the visual site design elements of the proposed solar energy facilities.

- Consulting on viewshed protection objectives and practices with the respective land management for landscapes having special designations, such as Wilderness Areas, National Scenic and Historic Trails, Wild and Scenic Rivers, National Parks, and National Wildlife Refuges located within the project's viewshed. Developers shall demonstrate a concerted effort to reconcile conflicts while recognizing that the BLM retains authority for final decisions determining project approval and conditions.

- For applications that include artifacts and remnants of a National Historic Trail, are located within the viewshed of a National Historic Trail's designated centerline, or include or are within the viewshed of a trail eligible for listing on the *National Register of Historic Places* (NRHP) by virtue of its important historical or cultural values and integrity of setting, evaluating the potential visual impacts on the trail associated with the proposed project; avoiding, minimizing, and/or mitigating adverse effects through the Section 106 consultation process; and identifying appropriate mitigation measures for inclusion as stipulations in the POD.

- Considering landscape settings observed from a unit of the National Park system, National Historic Sites, National Trails, and cultural resources of tribal concern that may be a part of the historic context contributing to the historic significance of the site or trail. Projects shall be sited and designed to avoid altering the visual setting in a way that would reduce the historic significance or function, even if compliant with VRM objectives.

- Project developers are encouraged to obtain topographical data of engineering-design quality and use digital terrain mapping tools at a landscape-viewshed scale for project location selection, site planning and design, visual impact analysis, and visual impact mitigation planning and design. The digital terrain mapping tools shall be at a resolution and contour interval suitable for site design and accurate placement of proposed developments into the digital viewshed. Visual simulations shall be prepared and evaluated in accordance with BLM Handbook H-8431-1 and other agency directives, to create spatially accurate and realistic depictions of the appearance of proposed facilities. Simulations shall depict proposed project facilities from key observation points (KOPs) and other visual resource sensitive locations.

- Conducting outreach through public forums as necessary to disseminate visual resource information such as offering organized tours of operating solar energy development projects, and using simulations in public presentations.

- Performing visual mitigation planning and design through field assessments, applied global positioning system (GPS) technology, photo documentation, use of computer-aided design and development software, three-dimensional GIS modeling software, and imaging software to depict visual simulations to reflect a full range of visual resource mitigation measures.

A.2.2.13.2 Site Characterization, Siting Design, and Construction

VR2-1 Solar facilities shall be sited and designed to minimize glint and glare.

(a) Identification of glint and glare effects shall include, but is not limited to, the following:

- Assessing and quantifying potential glint and glare effects and determining the potential safety and visual impacts associated

with glint and glare using appropriate and commonly accepted software, procedures, and past project examples.

- Having qualified individuals conduct assessments for glint and glare.

(b) Methods to minimize glint and glare effects may include, but are not limited to, the following:

- Limiting use of signs and project construction signs. Beyond those required for basic facility and company identification for safety, navigation, and delivery purposes, commercial symbols or signs and associated lighting on buildings and other structures should be prohibited.

- Utilizing retro-reflective or luminescent markers in lieu of permanent lighting.

- Minimizing off-site visibility of all commercial symbols and signs and associated lighting. Necessary signs should be made of non-glare materials and utilize unobtrusive colors. The reverse sides of signs and mounts should be painted or coated by using a suitable color selected from the BLM Standard Environmental Color Chart to reduce contrasts with the existing landscape; however, placement and design of any signs required by safety regulations must conform to regulatory requirements.

- Considering off-site mitigation of visual impacts. In some situations, off-site mitigation may serve as a means to offset and/or recover the loss of visual landscape integrity. For example, off-site mitigation could include reclaiming unnecessary roads, removing abandoned buildings, reclaiming abandoned mine sites, putting utility lines underground, rehabilitating and revegetating existing erosion or disturbed areas, or establishing scenic conservation easements. Appropriate offsite mitigation will be determined on a project-specific basis in consultation with the BLM.

VR2-2 Solar facilities shall be sited and designed to minimize night-sky effects.

(a) Identification of night-sky effects shall include, but is not limited to, the following:

- Assessing and quantifying potential lighting impacts on the night sky and nocturnal wildlife, while providing lighting for hazard marking, safety, and other necessary site needs.

- Conducting assessments for night-sky effects by qualified individuals using appropriate and commonly accepted procedures and past project examples.

(b) Methods to minimize night sky effects may include, but are not limited to, the following:

- Using minimum intensity lighting that meets safety criteria. When accurate color rendition is not required (e.g., roadway, basic security), lighting shall be amber in color, using either low-pressure sodium lamps or yellow LED lighting, or equivalent. When white light is required for accurate color rendition, it shall be equal to or less than 3500° Kelvin color temperature. Bluish-white lighting is discouraged.

- Prohibiting the use of red or white strobe lighting unless the BLM approves its use because of conflicting mitigation requirements.

- Fully shielding all permanent lighting (e.g., full cut-off), except for collision markers required by the FAA or other emergency lighting triggered by alarms.

- Mount lighting so that no light is emitted above an imaginary horizontal plane through the fixture.

- Considering lighting control through timers, sensors, dimmers, or switches that are available to facility operators.

- Considering vehicle-mounted lights over permanently mounted lighting for nighttime maintenance activities. When possible, such vehicle-mounted lighting shall be aimed toward the ground to avoid causing glare and skyglow.

VR2-3 The siting and design of solar facilities, structures, roads, and other project elements shall explore and document design considerations for reducing visual dominance in the viewshed and shall comply with the VRM class objectives in conformance with VR1-1.

(a) Assessing visual dominance shall include, but is not limited to, the following:

- Conforming with VRM class objectives through the use of the BLM contrast rating procedures defined in BLM Handbook H-8431-1. Visual contrast rating mitigation of visual impacts shall abide by the requirements outlined in the handbook and other

BLM directives. Revised project plans and simulations are to be reevaluated by using the contrast rating procedures.

- Selecting KOPs by first determining the extent of the viewshed by using the viewshed modeling tools previously cited under VR1-1. The viewshed modeling shall illustrate the areas from which the proposed facilities may be seen out to 25 mi (40 km). From within the areas, KOPs are to be selected at places where people would be expected: at scenic overlooks, roads, trails, campgrounds, recreationally active river corridors, residential areas, etc. For the purpose of conducting a visual contrast rating evaluation, the number of KOPs would be reduced to those that serve as the best representations for demonstrating conformance to the respective VRM class objectives. The BLM is consulted on the KOP selections, and the BLM reserves the right to require additional KOPs to further determine the extent of visual impact and conformance to VRM class objectives.

- Integrating visual design elements into the construction plans, details, drawings, and specifications for the project.

- Incorporating facility siting measures to minimize the profile of all facility-related structures to reduce visibility and visual dominance within the viewshed, particularly for facilities proposed within the foreground/middleground distance zone (0–5 mi [0–8 km]) of sensitive viewing locations.

(b) Measures to minimize visual dominance may include, but are not limited to, the following:

- Using existing topography and vegetation as screening or partially screening devices.

- Incorporating visual design elements when planning for grubbing and clearing, vegetation thinning and clearing, grading, revegetation, drainage, and structural measures.

- Minimizing visual dominance of projects by siting projects outside the viewsheds of KOPs or by diminishing dominance through maximizing visible separation with distance.

- Avoiding, when feasible, locating facilities near visually prominent landscape features (e.g., knobs and waterfalls) that naturally draw an observer's attention.

- Avoiding visual "skylining" by placing structures, transmission lines, and other facilities away from ridgelines, summits, or other locations where they would silhouette against the sky from important viewing locations.

- Designing linear features (e.g., ROWs and roads) to follow natural land contours rather than straight lines; however, consideration should be given to the potential for increased ground disturbance.

- Locating linear developments (e.g., transmission lines, pipelines, roads) at edges of natural clearings or natural lines of transition between vegetation type and topography.

- Considering alternative means of access in visually sensitive areas, to preserve the natural landscape conditions between tower locations.

- Minimizing vegetation and ground disturbance, and taking advantage of existing clearings where feasible.

- Reducing cut and fill for structures and roads by design and location. Retaining walls, binwalls, half bridges, etc., can be used to reduce cut and fill.

- Considering rounded and varied road-cut slopes and the cut-and-fill pitches to reduce contrasts in form and line; encouraging slope cuts to preserve specimen trees and nonhazardous rock outcroppings.

- Considering sculpting and shaping natural or previously excavated bedrock landforms when excavation of these landforms is required. For example, percent backslope, benches, and vertical variations may be integrated into a final landform that repeats the natural shapes, forms, textures, and lines of the surrounding landscape. The earthen landform may be integrated and transitioned into the excavated bedrock landform. Sculpted rock face angles, bench formations, and back slope could adhere to the natural bedding planes of the natural bedrock geology. The color contrast from the excavated rock faces may be removed by color treating with a rock stain. Native vegetation or a mix of native and non-native species (if necessary to ensure successful revegetation) could be reestablished with the benches and cavities created within the created bedrock formation.

- Designing and installing natural-looking earthwork landforms, or vegetative or architectural screening to minimize visual impacts. Considering shape and height of earthwork landforms for adaptation to the surrounding landscape.

- Repeating the size, shape, and characteristics of naturally occurring openings in vegetation for facilities, structures, roads, etc.

- Burying electrical collector lines, pipelines, communication and local utility lines to minimize additional surface disturbance where feasible (e.g., along roads or other paths of surface disturbance).

- Minimizing visual impacts associated with solar energy and electricity transmission projects by choosing appropriate building and structural materials and surface treatments (i.e., paints or coatings designed to reduce contrast and reflectivity). A careful study of the site should be performed to identify appropriate colors and textures for materials; both summer and winter appearance shall be considered, as well as seasons of peak visitor use. Materials and surface treatments shall repeat and/or blend with the existing form, line, color, and texture of the landscape.

- Considering the typical viewing distances and landscape when choosing colors. Appropriate colors for smooth surfaces often need to be two to three shades darker than the background color to compensate for shadows that darken most textured natural surfaces. The BLM Standard Environmental Color Chart CC-001 and guidance shall be referenced when selecting colors.

- Selecting appropriately colored materials for structures, or stains/coatings to blend with the project's backdrop. Materials, coatings, or paints having little or no reflectivity shall be used whenever possible.

- Color treating solar panel/mirror/heliostat backs/supports to reduce visual contrast with the landscape setting.

- Color treating solar towers to reduce visual contrast.

- Considering multiple color camouflage technology application projects within sensitive viewsheds and with a visibility distance that is between 0.25 and 2 mi (0.40 and 3.20 km).

- Matching aboveground pipelines' paint or coating to their surroundings.

- Considering the appropriate choice of monopoles versus lattice towers for a given landscape setting to further reduce visual impacts.

- Utilizing nonspecular conductors and nonreflective coatings on insulators for electricity transmission/distribution projects.

- Minimizing the use of signs. Where signs are necessary, they shall be made of non-glare materials and utilize unobtrusive colors. The reverse sides of signs and mounts shall be painted or coated by using the most suitable color selected from the BLM Standard Environmental Color Chart; however, placement and design of any signs required by safety regulations must conform to regulatory requirements.

- Clearly delineating construction boundaries and minimizing areas of surface disturbance; preserving vegetation to the greatest extent possible; utilizing undulating surface disturbance edges; stripping, salvaging, and replacing topsoil; using contoured grading; controlling erosion; using dust suppression techniques; and stabilizing exposed soils.

- Preserving existing rocks, vegetation, and drainage patterns to the maximum extent possible.

- Employing brush-beating, mowing, or use of protective surface matting rather than removing vegetation.

- Considering mulching and spreading slash from vegetation removal over fresh soil disturbances.

- Avoiding leaving slash piles in sensitive viewing areas.

- Considering restoration of disturbed soils by use of weed-free native grasses, forbs, and shrubs representative of the surrounding and intact native vegetation composition and/or using non-native species, if necessary, to ensure successful revegetation.

- Reducing visual color contrast of graveled surfaces with approved color treatment practices.

- Considering segregating and spreading topsoil from cut-and-fill activities on freshly disturbed areas to reduce color contrast.

- Avoiding leaving topsoil piles in sensitive viewing areas.

- Spreading excess cut and fill material within project disturbance area and vegetate per approved restoration plan requirements while maintaining natural drainage pathways. Where soil cannot reasonably be spread within project disturbance areas, excess cut and fill materials should be hauled out to minimize ground disturbance and impacts from piles.

- Removing stakes and flagging from the construction area after completion of construction.

VR2-4 Project developer shall perform a pre-construction meeting with BLM or their designated visual/scenic resource specialists, such as a landscape architect, to coordinate the project construction VRM mitigation strategy. Final design and construction documents will be reviewed with regard to the visual mitigation elements, assuring that requirements and commitments are adequately addressed. The review of construction documents will include, but not be limited to, grading, drainage, revegetation, vegetation clearing and feathering.

A.2.2.13.3 Operations and Maintenance

VR3-1 Compliance with the terms and conditions for VRM mitigation shall be monitored by the project developer. Consultation with BLM shall be maintained through operations and maintenance of the project, employing an adaptive management strategy and modifications, as necessary and approved by the BLM.

(a) Maintaining the visual resource design elements during operations and maintenance shall include, but is not limited to, the following:

- Maintaining revegetated surfaces until a self-sustaining stand of vegetation is reestablished and visually adapted to the undisturbed surrounding vegetation. No new disturbance shall be created during operations without completion of a VRM analysis and approval by the BLM-authorized officer.

- Keeping painted and color-treated facilities in good repair and repainted when the color fades or flakes.

- Using interim restoration during the operating life of the project as soon as possible after land disturbances.

- Including dust abatement and noxious weed control in maintenance activities.

- Deploying and operating mirrors/heliostats to avoid high-intensity light (glare) reflected off-site. Where off-site glare is unavoidable and project site/off-site spatial relationships favor effective results, fencing with privacy slats or similar screening materials should be considered.

A.2.2.13.4 Reclamation and Decommissioning

VR4-1 Reclamation of the construction site shall begin immediately after construction to reduce the likelihood of visual contrasts associated with erosion and invasive weed infestation and to reduce the visibility of temporarily disturbed areas as quickly as possible. Developers shall coordinate with BLM in advance of interim/final reclamation to have BLM or other designated visual/scenic resource specialists, such as a landscape architect, on-site during reclamation to work on implementing visual resource requirements and BMPs.

(a) Methods for minimizing visual contrast associated with reclamation and decommissioning of the project may include, but are not limited to, the following:

- Including treatments, such as thinning and feathering vegetation along project edges, enhanced contour grading, salvaging landscape materials from within construction areas, special revegetation requirements (e.g., use of mix of native and non-native species).

- Designing and implementing restoration of the project area to predevelopment visual conditions and the inventoried visual quality rating, or to that of the surrounding landscape setting conditions to the best extent possible or to conditions agreed upon by the BLM.

- Removing above-ground and near-ground level structures. Some structures may need to be removed to a level below the ground surface to allow reclamation/restoration.

- Considering contouring soil borrow areas, cut-and-fill slopes, berms, water bars, and other disturbed areas to approximate

naturally occurring slopes. Contouring to a rough texture would trap seeds and discourage off-road travel, thereby reducing associated visual impacts. Cut slopes can be randomly scarified and roughened to reduce texture contrasts with existing landscapes and aid in revegetation.

- Utilizing native vegetation to establish a composition consistent with the form, line, color, and texture of the surrounding undisturbed landscape.

- Reapplying stockpiled topsoil to disturbed areas, where applicable, or using a mix of native and non-native species if necessary to ensure successful revegetation.

- Removing or burying gravel and other surface treatments.

- Restoring rocks, brush, and forest to approximate pre-existing visual conditions.

- Integrating feathering edges of vegetation to reduce form and line contrasts with the existing landscapes.

A.2.2.14 Design Features for Noise

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on the acoustic environment from solar development that were identified and discussed in Sections 5.13.1 and 5.13.2 of the Draft and Final Solar PEIS.

A.2.2.14.1 General

N1-1 Project developers shall consult with the BLM in the early phases of project planning to assess and minimize the proposed project's noise impacts on sensitive noise receptors.

(a) Assessing noise impacts shall include, but is not limited to, the following:

- Taking measurements to assess the existing background ambient sound levels both within and outside the project site and comparing these with the anticipated noise levels proposed facility. The ambient measurement protocols of all affected land management agencies shall be considered and utilized. Nearby residences and likely sensitive human and wildlife receptor locations shall be identified.

- Conducting assessments for noise impacts by qualified individuals using appropriate and commonly accepted software, procedures, and past project examples.

- Evaluating impacts from noise as part of the environmental impact analysis for the project and considering options to avoid, minimize and/or mitigate adverse impacts in coordination with the BLM.

A.2.2.14.2 Site Characterization, Siting and Design, Construction

N2-1 The siting and design of solar facilities, structures, roads, and other project elements shall seek to minimize impacts on sensitive noise receptors.

(a) Methods to minimize project impacts on sensitive noise receptors may include, but are not limited to, the following:

- Enclosing noisy equipment when located near sensitive receptors.

- Posting warning signs at high-noise areas and implementing a hearing protection program for work areas with noise in excess of 85 dBA.

- Implementing a noise complaint process and hotline, including documentation, investigation, evaluation, and resolution of legitimate project-related noise complaints.

- Maintaining project equipment in accordance with manufacturers' specifications. For example, suitable mufflers and/or air-inlet silencers shall be installed on all internal combustion engines (ICEs) and certain compressor components.

- Limiting low-altitude (under 1,500 ft [457 m]) helicopter flights for installation of transmission lines near noise-sensitive receptors to locations where only helicopter activities can perform the installation.

- Scheduling construction activities to minimize disruption to nearby residents and existing operations surrounding the project areas.

- Planning noisy construction activities near sensitive receptors to the least noise-sensitive times of day (i.e., daytime between 7 a.m. and 7 p.m.) and weekdays.

- Coordinating individual noisy activities to occur at the same time to reduce the frequency of site boundary noise.

- Implementing noise control measures (e.g., erection of temporary wooden noise barriers) where activities are expected near sensitive receptors.

- Notifying nearby residents in advance of noisy activities, such as blasting or pile driving, before and during the construction period.

- Considering siting immobile construction equipment (e.g., compressors and generators) away from nearby residences and other sensitive receptors.

- Siting permanent sound-generating facilities (e.g., compressors, pumps) away from residences and other sensitive receptors. The use of acoustic screening may be required.

- Incorporating low-noise systems (e.g., for ventilation systems, pumps, generators, compressors, and fans) and selecting equipment without prominent discrete tones.

- Siting louvered side(s) of wet cooling tower(s) away from sensitive receptors. Noise impacts may be further reduced by selecting quieter fans and fans that operate at a lower speed, particularly if they operate at night. Silencers on fan stacks may also be used.

- Including noise reduction measures such as siting noise sources to take advantage of existing topography and distances and constructing engineered sound barriers and/or berms or sound-insulated buildings to reduce potential noise impacts at the locations of nearby sensitive receptors.

- Incorporating environmental inspection and monitoring measures into POD or other relevant plans to monitor and respond to impacts from noise during construction, operations, and decommissioning of a solar development, including adaptive management protocols.

A.2.2.14.3 Operations and Maintenance

N3-1 Compliance with the terms and conditions for noise shall be monitored by the project developer. Consultation with BLM shall be maintained through operations and maintenance of the project, employing an adaptive management strategy and modifications, as necessary and approved by the BLM.

(a) Methods for maintaining compliance with the noise design elements during operations and maintenance may include, but are not limited to, the following:

- Managing noise levels from cooling systems equipped with TES and dish engine technology so that levels at the nearest residences and sensitive receptor areas near the facility boundary are kept within applicable guidelines.

- Operating vehicles traveling within and around the project area in accordance with posted speed limits to reduce vehicle noise levels.

- Scheduling activities to minimize disruption to nearby residents and existing operations surrounding the project areas.

- Notifying nearby residents in advance of noisy activities, such as blasting or pile driving, before and during the reclamation and decommissioning activities.

- Monitoring and maintaining transformer noise levels. Considering installation of new transformers with reduced flux density, which generates noise levels as much as 10 to 20 dB lower than National Electrical Manufacturers Association (NEMA) standard values, or use of barrier walls, partial enclosures, or full enclosures to shield or contain the noise.

A.2.2.14.4 Reclamation and Decommissioning

N4-1 Reclamation of the construction site shall minimize the project's noise impacts on sensitive noise receptors.

A.2.2.15 Design Features for Paleontological Resources

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on paleontological resources from solar development that were identified and discussed in Sections 5.14.1 and 5.14.2 of the Draft and Final Solar PEIS.

A.2.2.15.1 General

P1-1 Project developers shall coordinate with the BLM early in the project planning process to identify and minimize impacts on paleontological resources.

(a) Identifying paleontological resources shall include, but is not limited to, the following:

- Determining in coordination with the BLM whether paleontological resources exist in a project area.

- Determining the potential presence of paleontological resources on the basis of the following: the sedimentary context of the area and its potential to contain paleontological resources (potential fossil yield classification [PFYC] class, if it is available); a records search of published and unpublished literature for past paleontological finds in the area; coordination with paleontological researchers working locally in potentially affected geographic areas and geologic strata; and/or depending on the extent of existing information, the completion of a paleontological survey.

(b) Methods to minimize impacts on paleontological resources may include, but are not limited to, the following:

- Instituting BMPs, such as training/education programs (see WEAP bullet below), to reduce the amount of inadvertent destruction to paleontological sites (see also P2-2 below). Project-specific management practices shall be established in coordination with the BLM, incorporating BLM IM 2009-011.

- Planning for management and mitigation of paleontological resources of the project area for areas of known presence or high potential of presence.

- Identifying measures to prevent potential looting/vandalism or erosion impacts and addressing the education of workers and the

public to make them aware of the consequences of unauthorized collection of fossils on public land.

- Incorporating key elements to mitigate the impacts on paleontological resources into a WEAP that is provided to all project personnel prior to entering the project work site. The WEAP shall be provided on a regular basis, covering multiple resources, to ensure the awareness of key mitigation efforts for paleontological resources of the project work site during all phases of the project's life. The base information the WEAP provides shall be reviewed and approved by the BLM prior to the issuance of a Notice to Proceed and incorporate adaptive management protocols for addressing changes over the life of the project, should they occur.

- Incorporating environmental inspection and monitoring measures into POD and other relevant plans to monitor and respond to paleontological resource impacts during construction, operations, and decommissioning of a solar development, including adaptive management protocols.

A.2.2.15.2 Site Characterization, Siting and Design, Construction

P2-1 Project developers shall use a qualified paleontological monitor during excavation and earthmoving activities in areas with high potential for paleontological resources.

P2-2 Project developers shall notify the BLM immediately upon discovery of fossils. Work shall be halted at the fossil site and continued elsewhere until qualified personnel, such as a paleontologist, can visit the site, determine the significance of the find, and, if significant, make site-specific recommendations for collection or other resource protection. The area of the discovery shall be protected to ensure that the fossils are not removed, handled, altered, or damaged until the site is properly evaluated and further action determined.

A.2.2.16 Design Features for Cultural Resources

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on cultural resources from solar development that were identified and discussed in Sections 5.15.1 and 5.15.2 of the Draft and Final Solar PEIS.

A.2.2.16.1 General

CR1-1 Project developers shall coordinate with the BLM early in the planning process to identify and minimize cultural resource impacts; the BLM will consult with other federal, tribal, state, and local agencies as appropriate.

(a) Determining cultural resource impacts shall include, but is not limited to, the following:

- Initiating Section 106 consultations between the BLM, SHPOs, Indian tribes, and other consulting parties early in the project planning process. Thresholds for the involvement of and review by the Advisory Council on Historic Preservation (ACHP) include non-routine interstate and/or interagency projects or programs; undertakings adversely affecting National Historic Landmarks; undertakings that the BLM determines to be highly controversial; and undertakings that will have an adverse effect and with respect to which disputes cannot be resolved through formal agreement between the BLM and SHPO, such as a Memorandum of Agreement (MOA).

- Conducting site-specific Section 106 review for individual projects. The BLM will require the completion of inventory, evaluation, determinations of effect, and treatment in accordance with the Solar Programmatic Agreement (PA). This Solar PA is titled "Programmatic Agreement among the United States Department of the Interior, Bureau of Land Management, the Arizona State Historic Preservation Officer, the California State Historic Preservation Officer, the Colorado State Historic Preservation Officer, the New Mexico State Historic Preservation Officer, the Nevada State Historic Preservation Officer, the Utah State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding Solar Energy Development on Lands Administered by the Bureau of Land Management."

(b) General methods to minimize cultural resource impacts may include, but are not limited to, the following:

- If historic properties which could be adversely affected are present in the project location, developing an MOA tiered to the Solar PA to address the mitigation steps which will be followed to avoid, minimize, or mitigate adverse effects on historic properties.

- Where the BLM determines that a specific proposed solar energy project has the potential to adversely affect historic properties but those effects cannot be determined prior to its approval, the BLM may elect to review a proposed solar energy project using an undertaking-specific PA executed pursuant to 36 CFR 800.6, instead of following the procedures outlined in the overarching Solar PA.

- Using training/educational programs for solar company workers to reduce occurrences of disturbances, vandalism, and harm to nearby historic properties. The specifics of these sensitivity training programs shall be established in project-specific consultations between the applicant, BLM, SHPO, and affected Indian tribes and will be articulated in a WEAP. Such education and awareness plans will incorporate adaptive management protocols for addressing changes over the life of the project, should they occur.

- Securing a performance and reclamation bond for all solar energy projects to ensure compliance with the terms and conditions of the ROW authorization. When establishing bond amounts and conditions, the BLM-authorized officer shall require coverage of all expenses tied to cultural resources identification, protection, and mitigation. These may include, but are not limited to, costs for ethnographic studies, inventory, testing, geomorphological studies, data recovery, curation, monitoring, treatment of damaged sites, and generation and submission of reports (see ROW authorization policies, Section 2.2.1.1).

A.2.2.16.2 Site Characterization, Siting and Design, Construction

CR2-1 Solar facilities shall be characterized, sited and designed, and constructed in coordination with the BLM to minimize cultural resource impacts.

(a) Methods to minimize impacts on cultural resources shall include, but are not limited to, the following:

- The BLM determining the APE for each proposed solar project, to include a review of existing information, and efforts to seek information from and views of tribes and other parties likely to have knowledge of or concerns with historic properties in the APE. This information will be supplemented by discussions at

pre-application meetings with the solar project applicant, SHPO, and affected tribes regarding project designs, sacred sites, traditional cultural properties (TCPs), and proposed cultural resource inventory strategies.

- The BLM consulting the SHPO, affected tribes (regarding the treatment of adverse effects for those property types on which the tribes indicate at pre-application or other meetings they wish to provide input), and any other consulting parties, if *National Register of Historic Places* (NRHP)-eligible properties are present at the site and would be adversely affected. The BLM will seek agreement to avoid, minimize, or mitigate adverse effects on historic properties. The BLM will execute an MOA with the SHPO to conclude the Section 106 process and will file a copy with the ACHP. Where the BLM and the SHPO are unable to execute an MOA, the BLM will invite the ACHP to participate in an undertaking-specific MOA. The MOA will specify the treatment for which the BLM will be responsible, and which will be implemented by the solar applicant.

- Undertaking a Class III inventory of the APE. If the BLM decides to require less than a Class III inventory for the entire APE, the BLM will seek additional views of the SHPO, affected tribes, and other parties and determine the final inventory strategy that best represents a reasonable and good-faith effort to carry out appropriate identification efforts.

- Conducting inventories according to the standards set forth in the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716); BLM Handbook H-8110 (*Handbook for Identifying Cultural Resources*); revised BLM Manual 8110; and applicable BLM or SHPO survey, site record, or reporting standards. All inventory data must be provided to the BLM in digitized or paper format that meets BLM accuracy standards, including shape files for surveyed areas.

- Bringing any unexpected discovery of cultural resources during any phase of development (construction, operations and maintenance, or decommissioning) to the attention of the responsible BLM-authorized officer immediately, as specified in the PA. Work shall be halted in the vicinity of the find. The area of the find shall be protected to ensure that the resources are not removed, handled, altered, or damaged while they are being evaluated and to ensure that appropriate mitigative or protective measures can be developed and implemented.

(b) Methods to minimize cultural resource impacts may include, but are not limited to, the following:

- Including in the MOAs measures for management of historic properties, in situations where historic properties require management or monitoring for avoidance and protection within or near a project's boundaries. Such measures will specify the preparation and implementation of steps to lessen the adverse effects of the undertaking upon those aspects of NRHP eligibility criteria that make the historic properties eligible for nomination to the NRHP.

- Requiring that surface disturbance be restricted or prohibited within the viewshed of such property types when their eligibility is tied to their visual setting to protect NRHP-eligible traditional cultural properties, sacred sites, or historic trails from visual intrusion and to maintain the integrity of their historic setting.

- Employing cultural field monitors (appropriate for the resource anticipated) to monitor ground-disturbing activities (for example in geomorphic settings, such as in shifting sands, where buried deposits may be present) in cases where there is a probability of encountering cultural resources during construction that could not be detected during prior Class III inventories. Monitoring plans shall be specified within MOAs.

- Encouraging the use of previously disturbed lands and lands determined by archeological inventories to be devoid of historic properties.

A.2.2.16.3 Reclamation and Decommissioning

CR3-1 Prior to reclamation activities, the BLM may require further planning for treatment of historic properties or planning for mitigation addressing reclamation activities.

CR3-2 The BLM shall be notified prior to the demolition or substantial alteration of any building or structure. If judged necessary by the BLM, the developer will be required to evaluate the structures for their significance employing professionally qualified architects or historic architects. If structures slated for demolition are found to be eligible for listing on the NRHP, they will be recorded to Historic American Building Survey and/or Historic American Engineering Record standards before alteration or removal.

CR3-3 Project developers shall confine soil-disturbing reclamation and decommissioning activities to previously disturbed areas. Known historic properties will be avoided during these activities.

A.2.2.17 Design Features for Native American Concerns

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts in areas of Native American concern regarding solar development; they are identified and discussed in Sections 5.16.1 and 5.16.2 of the Draft and Final Solar PEIS.

A.2.2.17.1 General

NA1-1 The BLM shall consult with federally recognized Indian tribes early in the planning process to identify issues and areas of concern regarding any proposed solar energy project as required by the National Historic Preservation Act (NHPA) and other authorities to determine whether construction and operation of a project is likely to disturb traditional cultural properties or sacred sites, impede access to culturally important locations, disrupt traditional cultural practices, affect movements of animals important to tribes, or visually affect culturally important landscapes.

(a) Identifying issues and areas of concern to federally recognized Indian tribes shall include, but is not limited to, the following:

- Covering planning, construction, operation, and reclamation activities during consultation. Agreements or understandings reached with affected tribes shall be carried out in accordance with the terms of MOAs or State Specific Procedures as defined within the Solar PA.

- The BLM consulting with affected Indian tribes during the Section 106 process at the points specified in the Solar PA.

- The BLM consulting with Indian tribes under the terms of the Native American Graves Protection and Repatriation Act (NAGRA). Any planning for treatment of historic properties or mitigation will take such consultations into account.

- The BLM seeking, during consultation, to develop agreements with affected tribes on how to appropriately respond to input and concerns in advance to save time and avoid confusion.

(b) Methods to minimize issues and areas of concern to federally recognized Indian tribes may include, but are not limited to, the following:

- Employing standard noise design features for solar facilities located near sacred sites to minimize the impacts of noise on culturally significant areas.

- Employing health and safety design features for the general public for solar facilities located near Native American traditional use areas in order to minimize potential health and safety impacts on Native Americans.

- Avoiding known human burial sites. Where there is a reasonable probability of encountering undetected human remains and associated funerary objects by a solar project, the BLM will carry out discussions with Indian tribes before the project is authorized to provide general guidance on the treatment of any cultural items (as defined by NAGPRA) that might be exposed.

- Avoiding visual intrusion on sacred sites through the selection of the solar facility location and solar technology. When complete avoidance is not possible, the BLM shall engage in timely and meaningful consultation with the affected tribe(s) and shall attempt to formulate a mutually acceptable plan to mitigate or reduce the adverse effects.

- Avoiding rock art (panels of petroglyphs and/or pictographs). These panels may be just one component of a larger sacred landscape, in which avoidance of all impacts may not be possible. Mitigation plans for eliminating or reducing potential impacts on rock art shall be formulated in consultation with the appropriate tribal cultural authorities.

- Avoiding springs and other water sources that are or may be sacred or culturally important. If it is necessary for construction, maintenance, or operational activities to take place in proximity to springs or other water sources, appropriate measures, such as the use of geotextiles or silt fencing, shall be taken to prevent silt from degrading water sources. The effectiveness of these mitigating barriers shall be monitored. Measures for preventing water depletion impacts on springs shall also be employed. Particular mitigations shall be determined in consultation with the appropriate Indian tribe(s).

- Avoiding culturally important plant species. When it is not possible to avoid impacting these plant resources, consultations shall be undertaken with the affected Indian tribe(s). If the species is available elsewhere on agency-managed lands, guaranteed access may suffice. For rare or less-common species, establishing (transplanting) or propagating an equal amount of the plant resource elsewhere on agency-managed land accessible to the affected tribe may be acceptable (e.g., for mesquite groves and rice grass fields, identified as tribally important plant species in the ethnographic studies).

- Avoiding culturally important wildlife species and their habitats. When it is not possible to avoid these habitats, solar facilities shall be designed to minimize impacts on game trails, migration routes, and nesting and breeding areas of tribally important species. Mitigation and monitoring procedures shall be developed in consultation with the affected tribe(s).

- Securing a performance and reclamation bond for all solar energy projects to ensure compliance with the terms and conditions of the ROW authorization. When establishing bond amounts and conditions, the BLM-authorized officer shall require coverage of all expenses tied to identification, protection, and mitigation of cultural resources of concern to Indian tribes. These may include, but are not limited to, costs for ethnographic studies, inventory, testing, geomorphological studies, data recovery, curation, monitoring, treatment of damaged sites, and generation and submission of reports (see ROW authorization policies, Section 2.2.1.1).

A.2.2.17.2 Site Characterization, Siting and Design, Construction

NA2-1 Prior to construction, the project developer shall provide training to contractor personnel whose activities or responsibilities could affect issues and areas of concern to federally recognized Indian tribes.

A.2.2.17.3 Operations and Maintenance

NA3-1 Consultation with affected federally recognized Indian tribes shall be ongoing during the life of the project.

NA3-2 The project developer shall train facility personnel regarding their responsibilities to protect any known resources of importance to federally recognized Indian tribes.

A.2.2.17.4 Reclamation and Decommissioning

NA4-1 The project developer shall confine reclamation and decommissioning activities to previously disturbed areas and existing access roads to the extent practicable.

NA4-2 The project developer shall return the site to its pre-construction condition, to the extent practicable and approved by the BLM.

A.2.2.18 Design Features for Socioeconomic Impacts

The following design features have been identified to avoid, minimize, and/or mitigate potential socioeconomic impacts from solar development identified and discussed in Sections 5.17.1 and 5.17.2 of the Draft and Final Solar PEIS.

A.2.2.18.1 General

S1-1 Project developers shall coordinate with the BLM and other federal, state, and local agencies to identify and minimize potential socioeconomic impacts.

(a) Identifying socioeconomic impacts shall include, but is not limited to, the following:

- Assessing the potential for socioeconomic impacts associated with the proposed project in coordination with the BLM and other qualified experts. Project developers shall collect and evaluate available information describing the socioeconomic conditions in the vicinity of the proposed project, as needed, to predict potential impacts of the project.

- Evaluating socioeconomic impacts as part of the environmental impact analysis for the project and considering options to minimize and/or mitigate impacts in coordination with the BLM.

(b) Methods to minimize socioeconomic impacts may include, but are not limited to, the following:

- Developing a community monitoring program that would be sufficient to identify and evaluate socioeconomic impacts resulting from solar energy development. Measures developed for monitoring may include the collection of data reflecting the

economic, fiscal, and social impacts of development at the state, local, and tribal level.

- Developing community outreach programs that would help communities adjust to changes triggered by solar energy development.

- Establishing vocational training programs for the local workforce to promote development of skills required by the solar energy industry.

- Developing instructional materials for use in area schools to educate the local communities on the solar energy industry.

- Supporting community health screenings.

- Providing financial support to local libraries for the development of information repositories on solar energy, including materials on the hazards and benefits of commercial development. Electronic repositories established by the project developer could also be of great value.

A.2.2.19 Design Features for Environmental Justice Impacts

The following design features have been identified to avoid, minimize, and/or mitigate potential environmental justice impacts from solar development identified and discussed in Sections 5.18.1 and 5.18.2 of the Draft and Final Solar PEIS.

A.2.2.19.1 General

EJ1-1 Project developers shall coordinate with the BLM and other federal, state, and local agencies to identify and minimize the potential for environmental justice impacts.

(a) Identifying environmental justice impacts shall include, but is not limited to, the following:

- Assessing the potential for environmental justice impacts associated with the proposed project in coordination with the BLM and other qualified experts. Project developers shall collect and evaluate available information describing the socioeconomic conditions in the vicinity of the proposed project, as needed, to predict potential environmental justice

impacts of the project (i.e., environmental, economic, cultural, and health impacts on low-income and minority populations).

- Evaluating environmental justice impacts as part of the environmental impact analysis for the project and consider options to avoid, minimize, and/or mitigate such risk in coordination with the BLM.

(b) Methods to minimize environmental justice impacts may include, but are not limited to, the following:

- Developing and implementing focused public information campaigns to provide technical and environmental health information directly to low-income and minority groups or to local agencies and representative groups. Including key information such as any likely impact on air quality, drinking water supplies, subsistence resources, public services, and the relevant preventative/minimization measures that may be taken.

- Providing community health screenings for low-income and minority groups.

- Providing financial support to local libraries in low-income and minority communities for the development of information repositories on solar energy, including materials on the hazards and benefits of commercial development.

- Establishing vocational training programs for the local low-income and minority workforce to promote development of skills for the solar energy industry.

- Developing instructional materials for use in area schools to educate the local communities on the solar energy industry.

- Providing key information to local governments and directly to low-income and minority populations on the scale and timeline of expected solar projects and on the experience of other low-income and minority communities that have followed the same energy development path.

- Considering making information available about planning activities that may be initiated to provide local infrastructure, public services, education, and housing.

A.2.2.20 Design Features for Transportation Impacts

The following design features have been identified to avoid, minimize, and/or mitigate potential transportation impacts from solar development identified and discussed in Sections 5.19.1 and 5.19.2 of the Draft and Final Solar PEIS.

A.2.2.20.1 Site Characterization, Siting and Design, Construction

T2-1 Project developers shall coordinate with the BLM, and other federal, state, and local agencies to identify and minimize impacts on transportation.

(a) Identifying impacts on transportation shall include, but is not limited to, the following:

- Assessing the potential for transportation impacts associated with the proposed project in coordination with the BLM and other appropriate state and local agencies. Consulting land use plans, transportation plans, and local plans as necessary. Developer may be required to perform traffic studies, analyses, or other studies of existing and proposed new roads capacity to physically handle the added wear and tear from increased construction commuter and truck traffic.

- Evaluating transportation impacts as part of the environmental impact analysis for the project and considering options to avoid, minimize, and/or mitigate such risk in coordination with the BLM.

(b) Methods to minimize impacts on transportation may include, but are not limited to, the following:

- Incorporating site access into the local and regional road network. Incorporation must be done under the supervision of the pertinent local, county, state, and federal agencies.

- Considering public roadway corridors through a site to maintain proper traffic flows and retain more direct routing for the local population.

- Considering implementing local road improvements, providing multiple site access locations and routes, staggering work schedules, and implementing a ride-sharing or shuttle program to minimize daily commutes of construction workers.

- Implementing traffic control measures to reduce hazards for incoming and outgoing traffic and streamline traffic flow, such as intersection realignment and speed limit reductions; installing traffic lights and/or other signage; and adding acceleration, deceleration, and turn lanes on routes with site entrances.

- Incorporating environmental inspection and monitoring measures into the POD and other relevant plans to monitor and respond to transportation impacts during construction, operations, and decommissioning of a solar development, including adaptive management protocols.

A.2.2.21 Design Features for Hazardous Materials and Waste

The following design features have been identified to avoid, minimize, and/or mitigate potential hazardous materials and waste impacts from solar development identified and discussed in Sections 5.20.1 and 5.20.2 of the Draft and Final Solar PEIS.

A.2.2.21.1 General

HMW1-1 Project developers shall coordinate with the BLM and other federal, state and local agencies early in the planning process to assess hazardous material and waste concerns and to minimize potential impacts.

(a) Assessing hazardous material and waste concerns shall include, but is not limited to, the following:

- Identifying expected waste generation streams at the solar energy site and hazardous waste storage locations for consideration in the environmental analysis evaluating the proposed project.

- Conducting site characterization, construction, operation, and decommissioning activities in compliance with applicable federal and state laws and regulations, including the Toxic Substances Control Act of 1976, as amended (15 USC 2601, et seq.). An example of complying with applicable law is reporting any release of toxic substances (leaks, spills, etc.) in excess of the reportable quantity established by 40 CFR Part 117 as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, Section 102b.

- Evaluating potential hazardous material and waste related impacts as part of the environmental impact analysis for the project and considering options to minimize and/or mitigate impacts in coordination with the BLM.

(b) Methods to minimize hazardous material and waste related impacts shall include, but are not limited to, the following:

- Developing a Hazardous Materials and Waste Management Plan that addresses the selection, transport, storage, and use of all hazardous materials needed for construction, operation, and decommissioning of the facility for local emergency response and public safety authorities and for the designated BLM land manager. Furthermore the plan shall address the characterization, on-site storage, recycling, and disposal of all resulting wastes.[3] At minimum, the plan will discuss facility identification; comprehensive hazardous materials inventory; Material Safety Data Sheets (MSDSs) for each type of hazardous material; emergency contacts and mutual aid agreements, if any; site map showing all hazardous materials and waste storage and use locations; copies of spill and emergency response plans, and hazardous materials-related elements of a Decommissioning and Site Reclamation Plan.

- Planning for waste management will address all solid and liquid wastes that may be generated at the site in compliance with the CWA requirements to obtain the project's NPDES or similar permit.

- Considering fire management in developing hazardous materials and waste management measures.

- Identifying and implementing prevention measures, including material substitution of less hazardous alternatives, recycling, and waste minimization.

- Establishing procedures for fuel storage and dispensing that consider health and safety of personnel and methods for safe use (i.e., fire safety, authorized equipment use).

- Ensuring vehicles and equipment are in proper working condition to reduce potential for leaks of motor oil, antifreeze, hydraulic fluid, grease, or other hazardous materials.

[3] It is not anticipated that any solar energy facility would have hazardous chemicals present on-site in such quantities as to require development of a Risk Management Plan as specified in 40 CFR Part 68.

- Considering establishing schedules regular removal of wastes (including sanitary wastewater generated in temporary, portable sanitary facilities) for delivery and removal by licensed haulers to appropriate off-site treatment or disposal facilities.

A.2.2.21.2 Site Characterization, Siting and Design, Construction

HMW2-1 Solar facilities shall be characterized, sited and designed, and constructed to minimize hazardous materials and waste management design elements.

(a) Methods to minimize hazardous material and waste management impacts may include, but are not limited to, the following:

- Indemnifying the United States against any liability arising from the release of any hazardous substance or hazardous waste on the facility or associated with facility activities.

- Providing a copy of any report required or requested by any federal agency or state government as a result of a reportable release or spill of any toxic substances shall be furnished to the BLM-authorized officer concurrent with the filing of the reports to the involved federal agency or state government.

- Designing and operating systems containing hazardous materials in a manner that limits the potential for their release.

- Establishing measures for construction with compatible materials in safe conditions.

- Establishing dedicated areas with secondary containment for off-loading hazardous materials transport vehicles.

- Implementing a "just-in-time" ordering procedures that are designed to limit the amounts of hazardous materials present on the site to quantities minimally necessary to support continued operations. Excess hazardous materials shall receive prompt disposition.

- Surveying project sites for unexploded ordnance, especially if projects are within 20 mi (32 km) of a current DoD installation or formerly utilized defense site.

- Siting refueling areas away from surface water locations and drainages and on paved surfaces; features shall be added to

direct any spilled materials to sumps or safe storage areas where they can be subsequently recovered.

- Designating hazardous materials and waste storage areas and facilities. Limiting access to designated areas to authorized personnel only.

A.2.2.21.3 Operations and Maintenance

HMW3-1 Compliance with the terms and conditions for hazardous materials and waste management shall be monitored by the project developer. Consultation with the BLM shall be maintained through the operations and maintenance of the project, employing an adaptive management strategy and modifications, as necessary and approved by the BLM.

(a) Methods for maintaining compliance with the terms and conditions for hazardous materials and waste management during operations and maintenance of the project may include, but are not limited to, the following:

- Installing sensors or other devices to monitor system integrity.

- Implementing robust site inspection and repair procedures.

A.2.2.21.4 Reclamation and Decommissioning

HMW4-1 Project developers shall maintain emergency response capabilities throughout the reclamation and decommissioning period as long as hazardous materials and wastes remain on-site.

HMW4-2 All design features developed for the construction phase shall be applied to similar activities during the reclamation and decommissioning phases.

A.2.2.22 Design Features To Ensure Health and Safety

The following design features have been identified to avoid, minimize, and/or mitigate potential health and safety impacts from solar development identified and discussed in Sections 5.21.1 and 5.22.2 of the Draft and Final Solar PEIS.

A.2.2.22.1 General

HS1-1 Project developers shall coordinate with the BLM and other federal, state, and local agencies early in the planning process to identify project health and safety risks and methods to minimize those risks.

(a) Assessing project health and safety risks shall include, but is not limited to, the following:

- Identifying and establishing federal and state occupational health and safety standards, such as the Occupational Health and Safety Administration's (OSHA's) Occupational Health and Safety Standards, 29 CFR Parts 1910 and 1926, respectively, for all phases of the project.

- Identifying safety zones or setbacks for solar facilities and associated transmission lines from residences and occupied buildings, roads, ROWs, and other public access areas that is sufficient to prevent accidents resulting from various hazards during all phases of development.

(b) Methods to minimize project health and safety risks may include, but are not limited to, the following:

- Identifying and accounting for general project injury prevention within the POD and the Health and Safety Plan, such as established PPE requirements, respiratory protection, hearing conservation measures, electrical safety considerations, hazardous materials safety and communication, housekeeping and waste handling, confined space identification, and rescue response and emergency medical support, including on-site first aid capability.

- Implementing training and awareness measures for workers and the general public to minimize and address standard practices (such as OSHA's) for the safe use of explosives and blasting agents; occupational electric and magnetic field (EMF) exposures; fire safety and evacuation procedures; and safety performance standards (e.g., electrical system standards and lighting protection standards). Consider further training for additional health and safety risks from the solar energy project and its ancillary facilities.

- Establishing measures to document training activities and reporting of serious accidents to appropriate agencies.

- Assessing cancer and noncancer risks to workers and the general public from exposure to facility emission sources that exceed threshold levels.

- Considering implementation of measures to reduce site emissions and the cancer and noncancer from exposure to facility emissions.

- Implementing a reporting structure for accidental release of hazardous substances to the environment where project developers shall document the event, including a root cause analysis, a description of appropriate corrective actions taken, and a characterization of the resulting environmental or health and safety impacts. Documentation of the event shall be provided to the permitting agencies and other federal and state agencies within 30 days.

- Considering manufacturer requirements, and federal and state standards when establishing safety zones or setbacks for solar facilities and associated transmission lines.

- Project developers coordinating with the BLM and appropriate agencies (e.g., the U.S. Department of Energy [DOE] and Transportation Security Administration [TSA]) to address critical infrastructure and key resource vulnerabilities at solar facilities in order to minimize and plan for potential risks from natural events, sabotage, and terrorism.

A.2.2.22.2 Site Characterization, Siting and Design, Construction

HS1-1 Solar facilities shall be characterized, sited and designed, and constructed to minimize risk to health and safety.

(a) Methods to minimize risk to health and safety may include, but are not limited to, the following:

- Designing electrical systems to meet all applicable safety standards (e.g., National Electrical Code [NEC]) and to comply with the interconnection requirements of the transmission system operator.

- Complying with applicable FAA regulations, including lighting requirements, to avoid or minimize potential safety issues associated with proximity to airports, military bases or training areas, or landing strips.

- Considering temporary fencing and other measures for staging areas, storage yards, and excavations during construction or decommissioning activities to limit public access to health and safety risks.

- Planning for traffic management of site access to ensure that traffic flow would not be unnecessarily affected and that specific issues of concern (e.g., the locations of school bus routes and stops) are identified and addressed. Planning may include measures, such as informational signs and temporary lane configurations. Planning shall be coordinated with local planning authorities.

- Considering use of alternative dielectric fluids that do not contain sulfur hexafluoride (SF_6) to reduce the global warming potential.

- Considering measures to reduce occupational EMF exposures, such as backing electrical generators with iron to block the EMF, shutting down generators when work is being done near them, and otherwise limiting exposure time and proximity while generators are running.

A.2.2.22.3 Operations and Maintenance

HS3-1 Compliance with the terms and conditions for health and safety shall be monitored by the project developer. Consultation with the BLM shall be maintained through operations and maintenance of the project, employing an adaptive management strategy and modifications, as necessary and approved by the BLM.

A.2.2.23 Design Features for National Scenic and Historic Trails, Suitable Trails, and Study Trails

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on trails from solar development that were identified and discussed in Sections 5.3, 5.12 and 5.15 of the Draft and Final Solar PEIS.

A.2.2.23.1 General

NSHT1-1 Project developers shall consult with the BLM and the trail administering agency early in the project planning to help determine the

proposed project's conformance with trail management prescriptions and other potential trail related constraints.[4]

(a) Assessing conformance to trail management prescriptions and other potential trail related constraints shall include, but is not limited to, the following:

- Considering National Trail management corridors established through the land use planning process as exclusion areas (see Section 2.2.2.1 of this Final Solar PEIS) in order to prevent substantial interference with the nature and purposes of designated National Scenic and Historic Trails, and to make efforts to avoid activities incompatible with trail purposes (NTSA Sec. 7(c)). Where no National Trail management corridor is established in a land use plan, or adequate protections for suitable trails or trails under study, an accepted National Trail inventory process must be conducted by the applicant, and in consultation with the trail administering agency. The inventory process will identify the potential area of adverse impact on the resources, qualities, values, and associated settings, and primary use or uses of the trails within the viewshed; prevent substantial interference; and determine any areas unsuitable for development. Residual impacts on trails will be avoided, minimized, and/or mitigated to the extent practicable according to program policy standards.

- Determining the size of the area of possible adverse impact through the results of the required inventory, in consultation with the trail administering agency. There is no current established minimum or maximum limit on the size of the area of possible adverse impact. Other design feature requirements and coordination requirements, such as for Cultural Resources, Recreation and Visitor Services, Visual Resources, or NLCS must also be met.

- Review of adequacy of information from National Scenic or Historic Trail inventory projects underway during the development of the Solar PEIS by the BLM at the field office level in coordination with the trail administering agency, and application of the data to determine the area of possible adverse impact for any anticipated development. Such inventory projects may reveal unanticipated or undocumented remnants, artifacts, trail tread or trace, the location of high potential historic sites

[4] Further guidance will be included in the forthcoming BLM National Trails System manual series and other NLCS-related policy manuals.

and high-potential route segments, trail features, and/or the associated settings for National Scenic or Historic Trails adjacent to or within SEZ.

- Applying on-site or off-site mitigation for any residual adverse impact according to program policy standards, and mitigation or impact reduction measures identified for related program areas in this document.

A.2.3 Proposed Solar Energy Zone-Specific Design Features

For projects to be located within SEZs, applicable SEZ-specific design features will be required in addition to the programmatic design features. The SEZ-specific design features have been established to address specific resource conflicts within individual SEZs identified through the course of the PEIS impact analyses. The updated proposed SEZ-specific design features for all the proposed SEZs are listed in Table A.2-2; these SEZ-specific design features have been revised from those presented in the Draft Solar PEIS on the basis of changes to the proposed SEZs made through the Supplement to the Draft Solar PEIS, and consideration of comments received as applicable. These design features are proposed as elements of BLM's Solar Development Program. With the signing of the Record of Decision (ROD) for the Final PEIS, the design features that are carried forward in the ROD will be required for all development within the applicable SEZs.

To accommodate the flexibility described in the BLM's program objectives and in light of anticipated changes in technologies and environmental conditions over time, the BLM has removed some of the prescriptive SEZ-specific design features presented in the Draft Solar PEIS and the Supplement to the Draft (e.g., height restrictions on technologies used to address visual resource impacts). Alternatively, the BLM will give full consideration to any outstanding conflicts in SEZs as part of the competitive process being developed through rulemaking (see Section 2.2.2.2.1 of this Final Solar PEIS).

TABLE A.2-2 Proposed Solar Energy Zone-Specific Design Features

SEZ	SEZ-Specific Design Features[a]
Arizona	
Brenda	*Water Resources*: Groundwater analyses suggest that full build-out of wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet-cooled projects should utilize water conservation practices. *Acoustic Environment*: Because of the proximity of the proposed Brenda SEZ to nearby residences and the Plomosa SRMA and the relatively high noise levels around the SEZ due to U.S. 60, refined modeling would be warranted along with background noise measurements during project-specific assessments.
Gillespie	*Lands and Realty*: Priority consideration should be given to utilizing the existing Agua Caliente Road to provide construction and operations access to the SEZ. Any potential impacts on the existing country road should be discussed with the county. *Recreation.* Because of the potential for solar energy to sever current access routes departing the county road within the SEZ, legal access to the areas to the south should be maintained consistent with existing land use plans. *Water Resources*: Groundwater analyses suggest that full build-out of wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet-cooled projects should utilize water conservation practices. *Wildlife (Mammals)*: The fencing around the solar energy development should not block the free movement of mammals, particularly big game species. *Visual Resources*: Due to potential visual impacts on two Wilderness Areas, visual impact mitigation should be considered for any solar development within the SEZ. (Note: Section 8.3.14.3 of this Final Solar PEIS incorrectly includes an SEZ-specific design feature stating that development of power tower facilities should be prohibited within the SEZ. This error will be corrected through the ROD for the Final Solar PEIS.) *Cultural Resources:* Recordation of historic structures through Historic American Building Survey/Historic American Engineering Record protocols through the National Park Service would be appropriate and could be required if any historic structures or features would be affected; for example, if the Gillespie Dam Highway Bridge were used as part of an off-site access route for a solar energy project.

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
California	
Imperial East	*Specially Designated Areas and Lands with Wilderness Characteristics:* Because of the potential increase in human use of the two adjacent ACECs, once solar energy facility construction begins, monitoring of the resources of the ACECs will be used to determine whether additional protection measures are needed to protect existing prehistoric resources. *Military and Civilian Aviation*: If power tower facilities are proposed for the SEZ, coordination across the international border should be required to ensure that there is no airspace management concern associated with the Mexicali Airport. *Minerals*: To protect the potential for geothermal leasing under solar energy facilities, ROW authorizations for solar energy facilities should be made subject to future geothermal leasing with no surface occupancy stipulations. *Water Resources*: Groundwater analyses suggest that full build-out of wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet-cooled projects should utilize water conservation practices. *Wildlife (Amphibians and Reptiles)*: The potential for indirect impacts on several amphibian species could be reduced by maximizing the distance between solar energy development and the All American Canal. *Wildlife (Amphibians and Birds)*: Wetland habitats along the southern boundary of the SEZ boundary shall be avoided to the extent practicable. The wetlands along the southern boundary of the SEZ have been designated as undevelopable, but other wetland areas may exist within the SEZ. *Wildlife (Mammals):* Solar project development shall not prevent mule deer free access to the unlined section of the All American Canal. *Special Status Species*: Occupied habitats for species that are designated as California fully protected species should be completely avoided. Under California Fish and Game Code Sections 3511, 4700, 5050, and 5515, take or possession of these species is prohibited at any time. Minimization and mitigation measures cannot be developed for California fully protected species. This policy applies to the following California fully protected species that may occur in the affected area of the Imperial East SEZ: California black rail and Yuma clapper rail.

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
California (Cont.)	
Imperial East *(Cont.)*	*Acoustic Environment*: Because of the proximity of the proposed Imperial East SEZ to nearby residences and the East Mesa ACEC, and relatively high noise levels around the SEZ due to I-8 and State Route 98, refined modeling, along with background noise measurements, should be conducted in conjunction with project-specific analyses. *Cultural Resources*: Consultation efforts should include discussions on significant archaeological sites and traditional cultural properties and on sacred sites and trails with views of the proposed SEZ. The possibility for discovering human burials in the vicinity of the proposed Imperial East SEZ, and its location along the Yuma-San Diego Trail interconnecting a sacred landscape and its associated sites should be discussed. Tribal participation in the Section 106 process will take place according to the Solar Programmatic Agreement (PA), including opportunities for tribal input regarding inventory design and treatment decisions and procedures for inadvertent discoveries during construction and operations.
Riverside East	*Specially Designated Areas and Lands with Wilderness Characteristics:* Once construction of solar energy facilities begins, the BLM would monitor whether there are increases in human traffic to the seven ACECs in and near the SEZ and determine whether additional design features are required to protect the resources in these areas. *Recreation:* A buffer area should be established between the Midland Long Term Visitor Area (LTVA) and solar development to preserve the setting of the LTVA. The size of the buffer should be determined based on the site and visitor-specific criteria. *Water Resources*: Groundwater analyses suggest that full build-out of wet-cooled or dry-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet- or dry-cooled projects should utilize water conservation practices. During site characterization, coordination and permitting with CDFG regarding California's Lake and Streambed Alteration Program would be required for any proposed alterations to surface water features. The use of groundwater in the Chuckwalla Valley and Palo Verde Mesa should be planned for and monitored in cooperation with the BOR and the USGS in reference to the Colorado River Accounting Surface and the rules set forth in the Law of the River.

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
California (Cont.)	
Riverside East *(Cont.)*	*Wildlife (Mammals)*: The fencing around the solar energy development should not block the free passage of mule deer between the Colorado River and mountains or foothills. *Wildlife and Special Status Species:* Within the SEZ, two north–south wildlife corridors of sufficient width (a minimum width of 1.3 mi ([2 km], but wider if determined to be necessary through future site-specific studies) should be identified by the BLM in coordination with the FWS and the California Department of Game and Fish. These corridors should be identified as non-development areas within the SEZ on the basis of modeling data and subsequent field verification of permeability for wildlife. *Visual Resources:* Special visual impact mitigation shall be considered for solar development on lands in the SEZ within areas west of Township 005S and Range 017E and north of Township 006S and Range 016E, as well as north of Sections 26, 27, 28, and 29 of Township 005S and Range 017E. *Cultural Resources*: Consultation efforts should include discussions on significant archaeological sites and traditional cultural properties and on sacred sites and trails with views of the proposed SEZ, such as the Salt Song, Cocomaricopa, and *Xam Kwatchan* Trails, which connect spiritual landscapes and sacred sites in the area. The possibility of discovering human burials in the vicinity of the proposed Riverside East SEZ should also be discussed. Significant resources clustered in specific areas, such as those surrounding Ford Dry Lake or within the DTC/C-AMA area, which retain sufficient integrity, should be avoided. Monitoring is recommended in sand sheet and colluvium environments similar to those in which buried sites were recently discovered during construction of the Genesis Solar development. Because the proposed Riverside East SEZ is located adjacent to or near six ACECs, it is possible that the ACECs could be subject to an increase in human and vehicle traffic. Potential construction vehicle corridors should be discussed prior to development of the proposed SEZ in order avoid possible impacts on historic resources within these ACECs and to determine alternative roads or paths to the development area.

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
Colorado	
Antonito Southeast	*Lands and Realty*: Management of the 1,240-acre (5.0-km^2) area of public land west of the proposed SEZ boundary should be addressed as part of the site-specific analysis of any future solar development within the SEZ. *Specially Designated Areas and Lands with Wilderness Characteristics:* The SEZ-specific design features for visual resources for this SEZ should be adopted, as they would provide some protection for visual related impacts on the Old Spanish Trail, the CTSR, and the San Antonio WSA. Early consultation should be initiated with the entity responsible for developing the management plan for the Sangre de Cristo NHA to understand how development of the SEZ could be consistent with NHA plans/goals. *Recreation:* As projects are proposed for the SEZ, the potential impacts on tourism should be considered and reviewed with local community leaders. *Water Resources*: Groundwater analyses suggest full build-out of wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet-cooled projects would have to reduce water requirements to less than approximately 1,000 ac-ft/yr (1.2 million m^3/yr) in order to secure water rights and comply with water management in the San Luis Valley. *Wildlife (Birds)*: If present, prairie dog colonies (which could provide habitat or a food source for some raptor species) should be avoided to the extent practicable. *Wildlife (Mammals)*: Construction should be curtailed during winter when big game species are present, particularly within elk severe winter range. Disturbance near the elk and mule deer resident population areas should be avoided.

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
Colorado (Cont.)	
Antonito Southeast *(Cont.)*	Where big game winter ranges intersect or are within close proximity to the SEZ, use of motorized vehicles and other human disturbances should be controlled (e.g., through road closures). Development in the 253-acre (1-km^2) portion of the SEZ that overlaps the pronghorn summer concentration area should be avoided. *Visual Resources*: The development of power tower facilities should be prohibited within the SEZ. Special visual impact mitigation shall be considered for solar development on lands in the SEZ visible from and within 3 mi (5 km) of the centerline of the West Fork of the North Branch of the Old Spanish Trail. Special visual impact mitigation shall be considered for solar development on lands in the SEZ visible from and within 3 mi (5 km) of the CTSR ACEC and San Antonio WSA. *Paleontological Resources*: Avoidance of PFYC Class 4 or 5 areas is recommended for development within the proposed Antonito Southeast SEZ (i.e., the 4-acre [0.016-km^2] parcel in the north part of the SEZ). Where avoidance of Class 4 or 5 deposits is not possible, a paleontological survey or monitoring would be required by the BLM. *Cultural Resources*: Development of a Memorandum of Agreement (MOA) may be needed among the BLM, Colorado SHPO, and other parties, such as the Advisory Council on Historic Preservation (ACHP) to address the adverse effects of solar energy development on historic properties. The agreement may specify avoidance, minimization, or mitigation measures. Should a MOA be developed to solve adverse effects on the Old Spanish Trail or the West Fork of the North Branch of the Old Spanish Trail, the Trail Administration for the Old Spanish Trail (BLM-NMSO and National Park Service [NPS] Intermountain Trails Office, Santa Fe) should be included in the development of that MOA. Additional coordination with the CTSR Commission is recommended to address possible mitigation measures for reducing visual impacts on the railroad.
De Tilla Gulch	*Recreation:* As projects are proposed for the SEZ, the potential impacts on tourism should be considered and reviewed with local community leaders.

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
Colorado (Cont.)	
De Tilla Gulch *(Cont.)*	*Water Resources*: Application of the design features regarding intermittent/ephemeral water bodies and storm water management should emphasize the need to maintain groundwater recharge for disturbed surface water features within the De Tilla Gulch SEZ. *Wildlife (Birds)*: Prairie dog colonies (which could provide habitat or food resources for some bird species) should be avoided to the extent practicable. *Wildlife (Mammals)*: The extent of habitat disturbance should be minimized within elk severe winter range and pronghorn winter concentration area. Construction should be curtailed during winter when big game species are present. Where big game winter ranges intersect or are within close proximity to the SEZ, motorized vehicles and other human disturbances should be controlled (e.g., through road closures). *Visual Resources*: The development of power tower facilities should be prohibited within the SEZ. *Cultural Resources*: Development of a Memorandum of Agreement (MOA) may be needed among the BLM, Colorado SHPO, and other parties, such as the Advisory Council on Historic Preservation (ACHP) to address the adverse effects of solar energy development on historic properties. The agreement may specify avoidance, minimization, or mitigation measures. Should a MOA be developed to resolve adverse effects on the Old Spanish Trail or the West Fork of the North Branch of the Old Spanish Trail, the Trail Administration for the Old Spanish Trail (BLM-NMSO and National Park Service [NPS] Intermountain Trails Office, Santa Fe) should be included in the development of that MOA

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
Colorado (Cont.)	
Fourmile East	*Specially Designated Areas and Lands with Wilderness Characteristics:* As part of project-specific analysis, early consultation should be initiated with the entity responsible for developing the management plan for the Sangre de Cristo NHA to understand how development could be consistent with goals of the NHA. *Recreation:* As projects are proposed for the SEZ, the potential impacts on tourism should be considered and reviewed with local community leaders. *Soil Resources:* The need for a study of the eolian processes that maintain the sand dune fields in Great Sand Dunes National Park should be determined. The study would support the assessment of whether building a solar facility close to the park could have impacts on the sand dunes there (by disrupting these processes). *Water Resources*: Groundwater analyses suggest full build-out of wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet-cooled projects would have to reduce water requirements to less than approximately 1,000 ac-ft/yr (1.2 million m^3/yr) in order to secure water rights and comply with water management in the San Luis Valley. *Wildlife (Birds and Mammals)*: If present, prairie dog colonies (which could provide habitat or a food source for some raptor species) should be avoided to the extent practicable. This would also reduce impacts on species such as the desert cottontail and thirteen-lined ground squirrel. To the extent practicable, construction activities should be avoided while pronghorn are on their winter range within the immediate area of the proposed Fourmile East SEZ. *Visual Resources*: The development of power tower facilities should be prohibited within the SEZ. Special visual impact mitigation shall be considered for solar development on lands in the SEZ visible from and within 5 mi (8 km) of the Sangre de Cristo WA and of the centerline of the high-potential segment of the Old Spanish National Historic Trail.

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
Colorado (Cont.)	
Fourmile East *(Cont.)*	*Paleontological Resources*: The depth to the Alamosa Formation within the proposed Fourmile East SEZ should be determined to identify any design features that might be needed in that area if solar energy development occurs. *Cultural*: Development of an MOA may be needed among the BLM, Colorado SHPO, and other parties, such as the ACHP, to address the adverse effects of solar energy development on historic properties. The agreement may specify avoidance, minimization, or mitigation measures. Should an MOA be developed to resolve adverse effects on the Old Spanish National Historic Trail, the Trail Administration for the Old Spanish Trail (BLM-NMSO and National Park Service [NPS] Intermountain Trails Office, Santa Fe) should be included in the development of that MOA. The possibility of encountering Native American human remains in the vicinity of the proposed Fourmile East SEZ should be discussed during consultation.
Los Mogotes East	*Specially Designated Areas*: Early consultation should be initiated with the entity responsible for developing the management plan for the Sangre de Cristo NHA to understand how development of the SEZ could be consistent with NHA plans and goals. *Recreation:* As projects are proposed for the SEZ, the potential impacts on tourism should be considered and reviewed with local community leaders. *Water Resources*: Groundwater analyses suggest full build-out of wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet-cooled projects would have to reduce water requirements to less than approximately 1,000 ac-ft/yr (1.2 million m^3/yr) in order to secure water rights and comply with water management in the San Luis Valley.

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
Colorado (Cont.)	
Los Mogotes East *(Cont.)*	*Wildlife (Amphibians, Reptiles, Birds)*: The access road should be sited and constructed to minimize impacts on wetlands and riparian areas (if present within the finalized access road location). *Wildlife (Birds and Mammals)*: Prairie dog colonies should be avoided to the extent practicable to reduce impacts on species such as raptors, desert cottontail and thirteen-lined ground squirrel. *Wildlife (Mammals)*: Construction should be curtailed during winter when big game species are present. Where big game winter ranges intersect or are close to the SEZ, motorized vehicles and other human disturbances should be controlled (e.g., through temporary road closures when big game are present). *Visual Resources*: The development of power tower facilities should be prohibited within the SEZ. *Paleontological Resources:* Avoidance of PFYC Class 4/5 areas is recommended for development within the proposed Los Mogotes East SEZ and for access road placement. Where avoidance of Class 4/5 deposits is not possible, a paleontological survey would be required. *Cultural Resources*: Development of a Memorandum of Agreement (MOA) may be needed among the BLM, Colorado SHPO, and other parties, such as the Advisory Council on Historic Preservation (ACHP) to address the adverse effects of solar energy development on historic properties. The agreement may specify avoidance, minimization, or mitigation measures. Should a MOA be developed to resolve adverse effects on the Old Spanish Trail or the West Fork of the North Branch of the Old Spanish Trail, the Trail Administration for the Old Spanish Trail (BLM-NMSO and National Park Service [NPS] Intermountain Trails Office, Santa Fe) should be included in the development of that MOA. Additional coordination with the CTSR Commission is recommended to address possible mitigation measures for reducing visual impacts on the CTSR.

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
Nevada	
Amargosa Valley	*Specially Designated Areas and Lands with Wilderness Characteristics:* Water use for any solar energy development should be reviewed to ensure that impacts on Death Valley NP, the Ash Meadows National Wildlife Refuge, and ACECs would be neutral or positive. *Recreation:* Relocation of the designated route used for desert racing and commercial tours should be considered at the time specific solar development proposals are analyzed. *Water Resources*: Groundwater analyses suggest that full build-out of wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet- and dry-cooled projects should utilize water conservation practices.
Dry Lake	*Water Resources*: Groundwater analyses suggest that full build-out of dry-cooled and wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed dry- or wet-cooled projects should utilize water conservation practices. *Wildlife (Mammals)*: The fencing around the solar energy development should not block the free movement of mammals, particularly big game species. *Cultural Resources*: Coordination with the Trail Administration for the Old Spanish Trail and Old Spanish Trail Association is recommended for identifying potential mitigation strategies for avoiding or minimizing potential impacts on the congressionally designated Old Spanish National Historic Trail and also on any remnants of the NRHP-listed sites associated with the Old Spanish Trail/Mormon Road that may be located within the SEZ. Avoidance of the Old Spanish Trail NRHP-listed site within the southeastern portion of the proposed SEZ is recommended. *Native American Concerns:* The Moapa Band of Paiute Indians have specifically requested formal government-to-government contact when construction or land management projects are being proposed on and/or near the Muddy River, the Virgin River, the Colorado River, the Arrow Canyon Range, Potato Woman, and the Apex Pleistocene Lake. Compensatory programs of mitigation could be implemented to provide access to and/or deliberately cultivate patches of culturally significant plants, like the mesquite groves present within the Dry Lake SEZ, on other public lands nearby where tribes have ready access.

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
Nevada (Cont.)	
Dry Lake *(Cont.)*	The BLM should consider assisting the Moapa Band of Paiute Indians with the preparation of forms to nominate identified sacred places as Traditional Cultural Properties, if it is found that all the proper eligibility requirements are met.
Dry Lake Valley North	*Lands and Realty*: Priority consideration should be given to utilizing existing County roads to provide construction and operations access to the SEZ. Any potential impacts on existing County roads would be discussed with the County. *Rangeland Resources (Livestock Grazing):* Within the Ely Springs cattle allotment, solar development should be sited to minimize the number of pastures affected, and existing range improvements should be relocated in coordination with the grazing permittee. *Rangeland Resources (Horses and Burros)*: Installation of fencing and access control, provision for movement corridors, delineation of open range, traffic management (e.g., vehicle speeds), compensatory habitat restoration, and access to or development of water sources should be coordinated with the BLM. *Recreation:* Because of the 11-mi (18-km) length of the SEZ and the potential for solar development to sever current east–west travel routes, legal vehicular access through the area should be maintained. *Water Resources*: Groundwater analyses suggest that full build-out of dry-cooled and wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed dry- or wet-cooled projects should utilize water conservation practices. *Wildlife (Mammals)*: The fencing around the solar energy development should not block the free movement of mammals, particularly big game species. *Cultural Resources:* The existing access road that connects the proposed SEZ to U.S. 93 should be upgraded instead of constructing a new access road to reduce ground disturbances and the potential for impacts on cultural resources.

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
Nevada (Cont.)	
Gold Point	*Water Resources*: Groundwater analyses suggest that full build-out of wet- and dry-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet- and dry-cooled projects should utilize water conservation practices. *Wildlife (Amphibians and Reptiles, Birds, and Mammals)*: Wash and playa habitats should be avoided. The major wash (significant unnamed intermittent stream) in the SEZ has been identified as a non-development area, but other avoidable washes may exist within the SEZ. *Wildlife (Mammals)*: The fencing around the solar energy development should not block the free movement of mammals, particularly big game species. *Acoustic Environment*: Because of the differences in elevation between the proposed Gold Point SEZ and nearby residences to the south, refined modeling will be warranted along with background noise measurements as a part of project-specific analyses.
Millers	*Recreation:* Alternative routes for the Las Vegas–Reno race should be considered consistent with local land use plan requirements. *Water Resources*: Groundwater analyses suggest that full build-out of wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet-cooled projects should utilize water conservation practices. *Wildlife (All)*: Wash and playa habitats should be avoided. The Ione Wash and a small wetland area in the SEZ have been identified as non-development areas, but other avoidable wash and playa habitats may exist within the SEZ. *Wildlife (Mammals)*: The fencing around the solar energy development should not block the free movement of mammals, particularly big game species.

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
Nevada (Cont.)	
Millers *(Cont.)*	*Cultural Resources:* Areas with a high potential for containing significant cultural resources or with a high density of cultural resources should be avoided. However, because of the high likelihood that the area contains prehistoric sites associated with Lake Tonopah and the presence of historic period sites related to the development of the Millers town site, complete avoidance of NRHP-eligible sites may not be possible. In particular, it may not be possible to fully mitigate the loss of such a large number of sites associated with one Pleistocene lake system.
New Mexico	
Afton	*Specially Designated Areas and Lands with Wilderness Characteristics*: The SEZ-specific design features for visual resources should be adopted, as they would provide some protection for visual-related impacts on the Aden Lava Flow WSA. *Water Resources*: Groundwater analyses suggest that full build-out of dry-cooled and wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed dry- or wet-cooled projects should utilize water conservation practices. *Wildlife (Amphibians and Reptiles, Birds, and Mammals)*: Impacts on wash, riparian, playa, rock outcrop, and wetland habitats, which may provide more unique habitats for some species, should be avoided, minimized, or mitigated. *Visual Resources*: Special visual impact mitigation should be considered for solar development on lands in the SEZ visible from and within 5 mi (8 km) of the Aden Lava Flow WSA. *Paleontological Resources*: Avoidance of the eastern edge of the SEZ may be warranted if a paleontological survey results in findings similar to those known south of the SEZ. *Cultural Resources*: Design features for reducing visual impacts on the El Camino Real National Historic Trail, the Butterfield Trail, and Mesilla Plaza National Historic Landmark would also reduce impacts on these cultural resources. Coordination with trails associations and historical societies regarding impacts on El Camino Real de Tierra Adentro, the Butterfield Trail, and Mesilla Plaza, as well as other NRHP-listed properties should be conducted.

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
Utah	
Escalante Valley	*Lands and Realty*: Priority consideration should be given to utilizing existing county roads to provide construction and operational access to the SEZ. *Water Resources*: Groundwater analyses suggest that full build-out of wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet-cooled projects should utilize water conservation practices. During site characterization, coordination and permitting with the Utah DWR regarding Utah's Stream Alteration Program would be required for any proposed alterations to surface water features. *Wildlife (All)*: Ephemeral washes shall be avoided. *Wildlife (Birds):* The steps outlined in the *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* should be followed. *Cultural Resources*: Avoidance of significant resources clustered in specific areas, such as those in the vicinity of the dunes, is recommended.
Milford Flats South	*Lands and Realty*: Priority consideration shall be given to utilizing existing county roads to provide construction and operational access to the SEZ. *Water Resources*: Groundwater analyses suggest that full build-out of wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet-cooled projects should utilize water conservation practices. During site characterization, coordination and permitting with Utah DWR regarding Utah's Stream Alteration Program would be required for any proposed alterations to surface water features. *Wildlife (Birds)*: The steps outlined in the *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* should be followed.

TABLE A.2-2 (Cont.)

SEZ	SEZ-Specific Design Features[a]
Utah (Cont.)	
Wah Wah Valley	*Lands and Realty:* Development may need to be restricted in the northern portion of the SEZ near the ranch development on private land to provide a buffer between private land developments and solar energy facility development. *Water Resources:* Groundwater analyses suggest that full build-out of wet-cooled technologies is not feasible; for mixed-technology development scenarios, any proposed wet-cooled projects should utilize water conservation practices. During site characterization, coordination and permitting with Utah DWR regarding Utah's Stream Alteration Program would be required for any proposed alterations to surface water features. *Wildlife (Birds)*: The steps outlined in the *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* should be followed. *Wildlife (Mammals)*: The inter-mountain basins big sagebrush shrubland cover type in the southeastern portion of the SEZ, which is the only identified suitable land cover for the elk and sagebrush vole and about a third of the suitable habitat for the American black bear in the SEZ, should be avoided. *Native American Concerns*: Compensatory programs of mitigation could be implemented to provide access to and/or deliberately cultivate patches of culturally significant plants, like the Indian ricegrass fields present within the Wah Wah Valley SEZ, on other public lands nearby where tribes have ready access.

Footnotes on next page.

TABLE A.2-2 (Cont.)

Abbreviations: ACEC = Area of Critical Environmental Concern; ACHP = Advisory Council on Historic Places; ADWR = Arizona Department of Water Resources; AUM = animal unit month; AZGFD = Arizona Game and Fish Department; BLM = Bureau of Land Management; BMP = best management practice; CDFG = California Department of Fish and Game; CDOW = Colorado Division of Wildlife; CESA = California Endangered Species Act; CTSR = Cumbres & Toltec Scenic Railroad; DOE = Department of Energy; DWMA = Desert Wildlife Management Area; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; KSLA = known sodium leasing area; LTVA – long-term visitor area; NDOW = Nevada Department of Wildlife; NDWR = Nevada Division of Water Resources; NHA = National Heritage Area; NMDGF = New Mexico Department of Game and Fish; NMOSE = New Mexico Office of the State Engineer; NP = National Park; NRHP = *National Register of Historic Places*; PA = Programmatic Agreement; PEIS = programmatic environmental impact statement; PYFC = potential fossil yield classification; ROW = right-of-way; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SNWA = Southern Nevada Water Authority; SRMA = Special Recreation Management Area; USFWS = U.S. Fish and Wildlife Service; VRM = visual resource management; WA = Wilderness Area; WRM = water resource management; WSA = Wilderness Study Area.

[a] The SEZ-specific design features listed in this table are proposed as an element of BLM's Solar Development Program. With the signing of the ROD for the Final PEIS, the design features will be required for utility-scale solar energy projects within the applicable SEZs.

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Chapters 8 through 13.

A.2.4 Framework for Developing a Monitoring and Adaptive Management Plan for the BLM's Solar Energy Program

A.2.4.1 Background

Comments to both the Draft Solar PEIS and Supplement to the Draft Solar PEIS indicate substantial public interest in a robust, long-term, scientifically sound monitoring and adaptive management plan for BLM's Solar Energy Program. Commentors with an interest in monitoring strategies expressed a preference for public engagement, transparency, and data availability.

In 2011, the BLM released the Assessment, Inventory and Monitoring (AIM) Strategy for condition and trend monitoring of BLM-managed resources and lands. The BLM supports the use of the AIM Strategy and monitoring framework as the basis for a long-term solar monitoring and adaptive management plan (Solar LTMP). AIM Strategy provides a replicable, consistent framework for collecting monitoring data across solar program areas and for adaptively managing siting and permitting of solar energy projects and SEZs. Further, an AIM-based Solar LTMP will take advantage of and augment other AIM efforts underway, including Rapid Ecoregional Assessments, the national landscape monitoring framework, greater sage grouse analysis, and an array of local, management-driven monitoring efforts. The information derived from these coordinated, multiprogram efforts will provide an unprecedented understanding of the condition and trend of BLM-administered lands and support informed decision making across jurisdictional boundaries.

At present, data collected using survey-level protocols inform permit decisions for solar projects on BLM-managed lands. Because the intent of such data collection is to ascertain site-specific impacts, the data often do not encompass areas or control sites outside of project boundaries or across varied landscapes. Further, such project-level data are not generally collected continuously over temporal scales. Project-level decisions, including ROW grant stipulations and mitigation requirements, would benefit from more broadly and consistently collected ecological data and other nonbiological (e.g., visual, noise, cultural, and socioeconomic) information. The BLM intends to coordinate the capture of monitoring data with partners and permittees through the deployment of the Solar LTMP across Solar PEIS program lands and appropriate control sites. This information will be used to generate essential information needed for sound decision making during the permitting, operation, and restoration phases of solar projects.

Solar projects in both SEZs and variance areas will be required to abide by the monitoring and adaptive management prescriptions of the Solar Energy Program. The BLM believes, however, that there will be greater efficiency and financial predictability related to monitoring needs in SEZs. The BLM expects that monitoring costs will be lessened for projects in SEZs due to the extensive avoidance and minimization efforts that went into the establishment of these priority areas (i.e., fewer impacts to monitor). The BLM is in a unique position to pre-plan for monitoring in these areas because, following the designation of any SEZs, it is expected that there will be interest in siting solar energy projects in these areas and their locations will be known. The BLM will take an active role in the collection of priority baseline data for SEZs

(especially at broader scales and via remote sensing) and the development of a consistent monitoring schema that will likely reduce the administrative and financial costs to developers in SEZs (note, however, that collection of project-level baseline data will largely be the responsibility of developers). Costs are also expected to be reduced in SEZs due to the ability to pool investments for monitoring and coordinate with other federal, state, and local agencies to maximize partnerships and data sharing.

A.2.4.2 Introduction to the AIM Strategy

In 2011, BLM released the AIM Strategy for national use in monitoring the condition and trend of BLM-managed resources and lands (BLM 2011). As shown in Figure A.2.4-1, the implementation framework for the AIM Strategy is an iterative process that generates a body of consistent and compatible data collected across diverse landscapes to provide unbiased information for sound, defensible land management decisions.

The AIM Strategy monitoring approach is based on sampling at two primary scales, **intensive** and **extensive**, which, when used together, increase the value of the monitoring effort. Intensive monitoring provides relatively high-density sampling within a focal management area

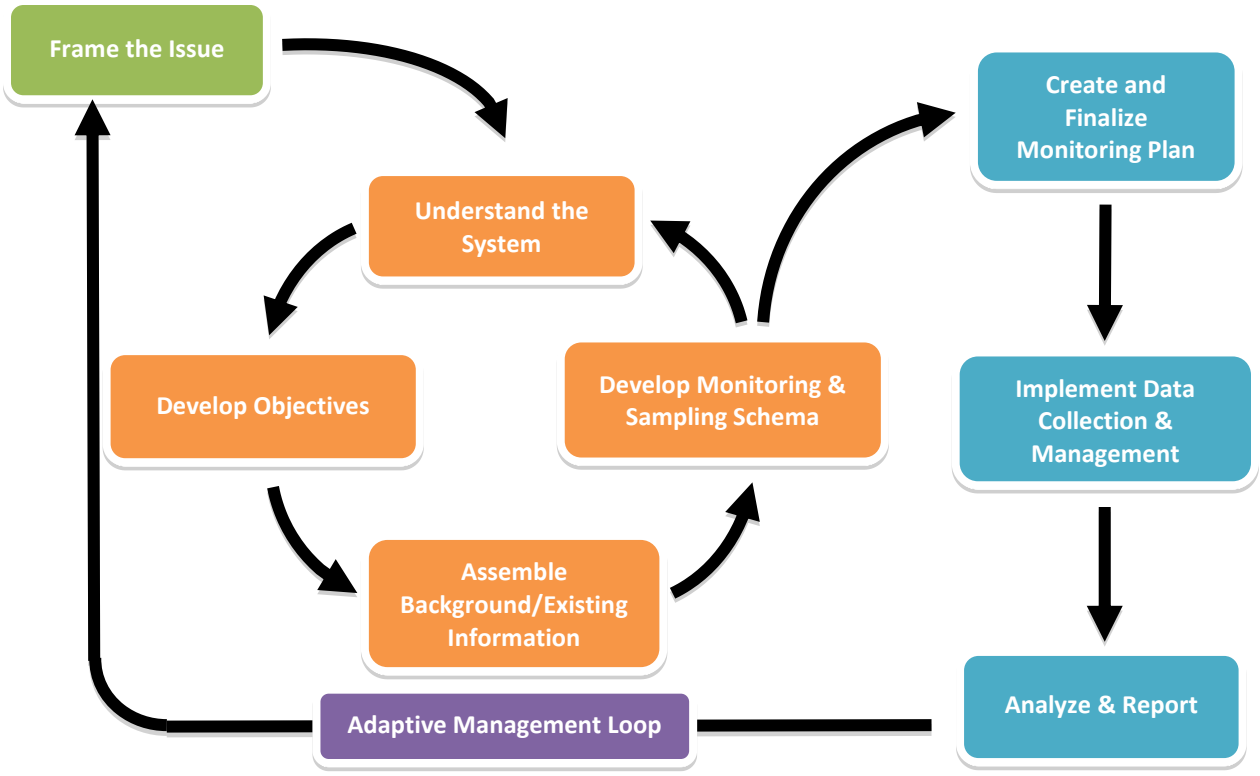

FIGURE A.2.4-1 Framework for AIM Strategy (Often Depicted as a Linear Sequence of Steps, Developing and Using a Robust Monitoring Program Is an Iterative Process Involving Multiple Steps and Several Nested Loops)

(e.g., an SEZ or project area), to inform specific management objectives. Extensive monitoring provides a low-intensity sampling grid across a broad, ecologically defined geographic area (e.g., the Sonoran Desert) for regional baseline, condition, and trend reporting. Sampling at both scales provides valuable, integrated information for management of individual solar deployments and broader landscapes across solar jurisdictional boundaries.

AIM monitoring methods to gather data at the intensive and extensive scales include field and remote-sensing collection techniques. Field techniques are consistent and compatible across landscapes and provide statistically valid estimates of conditions and trends. Remote-sensing techniques maintain their utility at multiple scales and provide spatial pattern, distribution, and abundance information. In turn, field data provide critical ground-truthing information to train and validate remote imagery.

The AIM Strategy monitoring approach hinges on the development of **conceptual models** that describe the relationship between key ecosystem components, processes, and stressors. Developing conceptual models for the solar program will require the BLM to work collaboratively with permittees, cooperating agencies, and other stakeholders to describe in detail and at multiple scales the components and processes that are essential to sustain the ecosystem. A robust conceptual model (described below) drives the selection of **supplemental indicators** for monitoring that are relevant to the studied ecosystem, local management questions, and the permitted activities.

The BLM has published guidance on its AIM-specific **core indicators** and methods specific to terrestrial resources (BLM 2011). AIM-specific core indicators were selected from a conceptual model based on land health. Under the AIM strategy, the BLM monitors core indicators across all BLM-administered lands to provide consistency across jurisdictional boundaries. While AIM core indicators address the need for consistent multiscale reporting needs, local monitoring needs are incorporated through the use of supplemental indicators specific to the particular landscape, habitat, or SEZ. For example, supplemental indicators for SEZs might include air quality, viewshed quality, or groundwater availability.[5]

The AIM Strategy monitoring approach provides a robust, responsive basis for building a monitoring and adaptive management plan for the BLM's Solar Energy Program (i.e., Solar LTMP). The AIM Strategy monitoring approach is initially resource independent and is "customized" to develop the Solar LTMP by following the AIM process and incorporating solar-related management questions to build ecosystem conceptual models for the landscapes where solar development will be implemented. The Solar LTMP outline, based on the AIM Strategy monitoring implementation framework, is described in the sections below.

The Solar LTMP will engage an interdisciplinary team (IDT) to ensure the successful implementation of monitoring and adaptive management activities across the Solar Energy Program. The IDT would ideally include leadership and oversight from within BLM's Solar Energy Program, with technical assistance from BLM's National Monitoring Program. IDT

[5] Core indicators will help determine the forage availability for the desert tortoise, while supplemental indicators could determine the impact of dust on forage.

members would include practitioners and experts from the BLM's National Operations Center, renewable energy policy and program leaders from the relevant State Office, and resource specialists from the relevant field office(s). Stakeholders from the local and state government, the development community, environmental organizations, tribes, and the larger community where SEZs are sited would be engaged both formally and informally throughout the process. The IDT will engage in a pilot of the Solar LTMP (described below).

A.2.4.2.1 Frame the Issue

- Identify management questions (including stakeholder involvement).
- Define study areas and determine scale of effort (national, regional, local).
- Review regulatory requirements (FLPMA, RMPs, standards, etc.).

The IDT frames the issue by identifying specific management questions and geographies of interest for the LTMP. Management questions shall include consideration of both development actions and any associated mitigation efforts. Interpretation of the FLMPA, regulatory standards and directions, land use plans, and stakeholder input will aid in the development and refinement of management questions. The IDT also reviews existing biological opinions and monitoring requirements. National and state-level IDT members guide a discussion to determine a suite of national-level management questions to be applied across all SEZs. Then, field or district level resource specialists on the IDT will identify local-scale, resource-specific management questions for the specific SEZ and solar project. Stakeholders contribute information to identify past and future concerns relevant to utility-scale solar projects.

A.2.4.2.2 Understand the System

- Review existing literature and models.
- List key ecological components, interactions, and processes essential for system sustainability.
- List drivers related to system functioning.
- Review relevant local/traditional knowledge.
- Review AIM conceptual model.
- Create regionally specific conceptual model; adapt/add detail related to listed processes, drivers, and needs to the AIM model.

To understand the system, the IDT reviews existing literature and conceptual ecological models and integrates expert opinion and local/traditional knowledge. More specifically, the IDT integrates a number of ways to identify key ecological components, interactions, processes and drivers related to system sustainability for each SEZ. These key factors are the basis for a hypothetical understanding of ecological functioning and are formalized in ecoregional and project-specific conceptual models. Existing, peer-reviewed models can be used; if existing

models do not exist, ecological components, interactions, processes, and drivers should be used to create models at multiple scales (e.g., site, watershed, landscape, and ecoregion). The detail of these models should be appropriate for the scale of the management questions but should describe ecologically meaningful relationships between key ecosystem components. In addition to the management questions, these conceptual models will serve as the foundation for the Solar LTMP. For example, the models will be used for core indicator verification and supplemental indicator selection, describing ecological integrity and cumulative effects, framing mitigation effectiveness, and so on. For consistency, models and model frameworks will be shared across SEZs as appropriate.

A.2.4.2.3 Develop Objectives

- List regulatory requirements and program needs, including land health fundamentals and standards.
- Consider key ecological elements (defined by the conceptual model), management questions, and regulatory requirements to ensure core indicators and methods fulfill needs.
  - Add SMART supplemental indicators as necessary.
- Develop SMART monitoring objectives related to core and supplemental indicators.

To develop monitoring objectives, the IDT inventories management questions, regulatory requirements, and program needs, including land health fundamentals and standards, as well as key ecological elements as defined in the conceptual model. Considering both management questions and ecological concepts, the IDT then determines whether the data collected using the AIM core indicators and methods are adequate to inform all local and program monitoring objectives. In the event that the core indicators are not comprehensive enough, the IDT identifies and describes supplemental indicators that will provide the necessary data.

All monitoring indicators and objectives identified must be specific, measurable, achievable, relevant, and time sensitive (SMART) and derived from the ecosystem conceptual models and/or linked to specific management questions. For example, by indicating the desired amount of change (specific), level of confidence for the measured change (measurable), funding and capacity requirements (achievable), relationship to the management question (relevant), and time frame during which the measurement occurs to effectively inform management (time sensitive). In addition to providing data to inform objectives, indicators can serve as a common currency to validate the selection of offsite mitigations area and to inform the effectiveness of mitigation measures.

A.2.4.2.4 Assemble Background and Existing Information

- Review and assemble existing research to support supplemental indicators and methods.
- Identify related, existing, and legacy monitoring efforts.
- Identify and assemble existing reference/base data (e.g., to support sample stratification).

In this step, the IDT reviews and assembles pre-existing work efforts, knowledge, and/or science and other information (such as local input from stakeholders) to reduce potential redundancy, and identify base layers available for mapping needs. The IDT performs a literature review to justify the selection of supplemental indicators and determine appropriate peer-reviewed methods for data collection. The IDT also evaluates past and existing monitoring efforts by the BLM or other parties at multiple scales, and related data within the BLM, cooperating agencies, tribes, academic institutions, and relevant non-governmental organizations (NGOs) to determine quality and relevance to derive supplemental indicator status and function. The IDT assembles existing reference data (e.g., vegetation maps, ecological site potential, topography, and administrative areas) to support project design and implementation.

A.2.4.2.5 Develop Monitoring and Sampling Schema

- Refine study area.
- Identify potential data collection approaches for selected indicators.
  - Field and/or remote sensing based.
- Choose sample design, stratification, and intensity.
- Generate unbiased sample points.

The IDT finalizes the study area to include the SEZ, adjacent variance areas, and other surrounding lands if they are determined to be within the selected monitoring scale (e.g., site, watershed, landscape, ecoregion). The IDT confirms and optimizes the data collection approaches (field versus remote sensing) and sample design necessary to meet the monitoring objectives and thus inform the management questions at the desired level of precision. In doing so, the IDT considers the spatial distribution, stratification, sampling weights, and temporal interval of sampling visits. All of the information gathered provides the input for the AIM monitoring sample design "calculator" to generate unbiased sample points across the study area (SEZ and adjacent areas) that are consistent and compatible with AIM-monitoring sampling at multiple scales throughout the BLM.

A.2.4.2.6 Create and Finalize Monitoring Plan

- Define and document protocol decision rules for replacing sample points, locating and laying out plots, and collecting/recording data.
- Optimize data collection (field and/or remote sensing).
- Finalize/approve monitoring plan.
- Develop/approve monitoring implementation plan.

For a given solar project, the IDT coordinates the definition, or refinement, of decision rules for placing sample points, locating and laying out plots, and collecting/recording data (to be consistent across all proposed SEZs). For consistency and compatibility and to ensure the success and utility of the Solar LTMP, National AIM team members will contribute to the development of an initial set of decision rules. The core indicators will be implemented as described in AIM Technical Note 440 (see the Solar PEIS project Web site: http://solareis.anl.gov) and collected to the AIM national data standard; supplemental indicators will use peer-reviewed, accepted methods. To optimize the efficiency of data collection and integration of broad-scale monitoring objectives, and to address site access issues, remotely sensed data will be integrated with field visits. The final Solar LTMP will receive technical approvals from BLM national and state monitoring leads. To develop a monitoring implementation plan, the IDT will consider the devised plan and determine the cost for the Solar LTMP over the life of the Solar PEIS or utility of the SEZ, including time for decommissioning and site stabilization or restoration. A final plan will also catalog necessary staff resources to deploy the monitoring program.

A.2.4.2.7 Implement Data Collection and Management

- Implement monitoring plan and collect data.
- Perform quality assessment/quality control (QA/QC) and data stewardship.
- Upload data to national monitoring database.
- Review, approve, and replicate to production database.

To implement and ensure consistency throughout the Solar LTMP, all IDT staff and contractors will be required to complete annual training and calibration activities. All data will be collected using the Database for Inventory, Monitoring and Assessment (DIMA). All field collection tools will meet the minimum standards established for AIM monitoring tools. Field-collected data will undergo initial quality assurance/quality control (QA/QC) steps conducted by the office managing the SEZ and will then be uploaded into the corporate national database (in development) for additional local- and state-level QA/QC validation. National data stewards will transfer data to the national monitoring publication database, as appropriate. The data quality plan will include stewardship requirements at the field, state, and national offices. Field user support and maintenance of the national database will be needed and may require additional capacity.

A.2.4.2.8 Analysis and Reporting

- Analyze/evaluate data against monitoring objectives and/or land health standards.
- Communicate results as appropriate.
- Complete annual reports.

Monitoring indicators will be interpreted against monitoring objectives, ecological potential, land health standards, and/or management thresholds (identified, for example, within land use plans). Raw data and/or derived data products will be available to the public in a timely manner. Consistent with other sensitive data, the exact point location will be buffered for publicly available data to protect the integrity of the sample site. A critical element of the Solar LTMP will be the production of an annual report summarizing the condition and trend of areas under analysis. This report will be made available to the public. The annual reports will be used to determine management and mitigation effectiveness. Analysis of condition and trend reports will adaptively feed back into the monitoring planning process for relevant SEZs and the solar program more generally (see adaptive management below).

A.2.4.2.9 Adaptive Management

- Analyze monitoring results in annual reports against resource objectives and conceptual model.
- Adapt activities, models, and monitoring plan as necessary.
- Incorporate lessons learned into future activities and management actions.

As part of the Solar LTMP, the BLM will establish meaningful, measureable objectives and impact thresholds (e.g. maintain or reestablish a defined percentage of pre-disturbance vegetation cover). Monitoring information will be evaluated against established objectives and thresholds, and specific management changes will be required if such objectives or thresholds are not met or are exceeded. The BLM will use information derived from the Solar LTMP to adaptively manage projects, the Solar Energy Program, Solar LTMP conceptual models, and the Solar LTMP more generally. For example, Solar LTMP outputs can aid the BLM in efforts to review project-level construction compliance activities and adjust future project compliance decisions. Information may be used to amend BLM's Solar Energy Program by adopting new or revised SEZ-specific design features or SEZ boundaries, developing new or revised programmatic design features, or establishing new or revised exclusions (changes to the BLM's Solar Energy Program will be subject to appropriate environmental analysis and land use planning and the related requirements for public involvement). The BLM may modify Solar LTMP conceptual models to include or exclude stressors, increase specificity of resource stressor interactions, or add or remove supplemental monitoring indicators based on the results of monitoring efforts. In addition, the BLM may use monitoring information to adapt the Solar LTMP to increase or decrease the frequency of sample collection and/or accommodate precision and accuracy requirements, or add or remove supplemental monitoring indicators.

A.2.4.3 Building and Testing a Solar LTMP

The BLM is proposing to pilot the Solar LTMP in a limited fashion initially by implementing the steps outlined above in one or more of the proposed SEZs. Results of the pilot will aid the BLM in refining the LTMP framework and will allow for replication of a sound process across the remainder of the SEZs and other program lands. Participants in the pilot will include BLM staff, other federal, state, and local partners, and interested stakeholders. The BLM has established partnership with Argonne and Lawrence Berkeley National Laboratories and secured start-up funds to begin work on the LTMP pilot. Additional funds to support the Solar LTMP pilot are being sought through DOE's Solar Energy Technologies Program.

The BLM's goal for the pilot effort is to develop a comprehensive, but cost-effective and achievable Solar LTMP. Through the pilot, the BLM will determine the appropriate level of stakeholder involvement, identify key participants to serve on IDTs, and establish staff resources internally. Through the pilot, the BLM will seek to establish consensus with stakeholders on the appropriate management questions, monitoring objectives, and indicators. The BLM will investigate opportunities for federal, state, and local partnerships that may help minimize costs associated with monitoring (e.g., entities that may be willing to share in the collection of information for supplemental indicators). The BLM will also investigate potential sources of baseline information. The BLM will use the pilot to evaluate the ability to collect information using remotely sensed platforms to limit the amount of data collected on the ground and therefore reduce overall costs. Through the pilot, the BLM will also consider potential costs to solar applicants and cost-share opportunities.

The BLM will make information about the pilot available through the Solar PEIS project Web site (http://solareis.anl.gov). This will include notification of opportunities for public and stakeholder involvement.

A.2.5 Draft Framework for Developing Regional Mitigation Plans for the BLM's Solar Energy Program

A.2.5.1 Purpose

Comments on both the Draft Solar PEIS and Supplement to the Draft Solar PEIS encouraged the BLM to incorporate a robust mitigation framework into the proposed Solar Energy Program. While the BLM currently employs mitigation for individual projects, commenters recommended that the proposed Solar Energy Program adopt a transparent, systematic, equitable, and cost-efficient approach to mitigation for any priority development areas (i.e., SEZs). The BLM is in a unique position to pre-plan for mitigation for projects in SEZs because, following the designation of any SEZs, it is expected that there will be interest in siting solar energy projects in these areas and their locations will be known. The BLM proposes to accomplish this goal by developing regional mitigation plans for SEZs.

In the Supplement to the Draft Solar PEIS, as part of its incentives for SEZs, the BLM presented the concept of regional mitigation plans. A draft framework for developing regional mitigation plans was posted on the Solar Project Web site (http://solareis.anl.gov) between the publication of the Supplement to the Draft Solar PEIS and this Final Solar PEIS to foster stakeholder engagement on this initiative. The framework presented here has been revised to address the comments received through this outreach effort.

A.2.5.2 Mitigation Hierarchy

The BLM's proposed Solar Energy Program under both action alternatives will employ a mitigation hierarchy to address potential impacts from utility-scale solar energy development—avoidance, minimization, and offset of unavoidable impacts. The BLM first employs avoidance and minimization strategies to eliminate or reduce potential adverse impacts from solar energy development. For those impacts that are not fully avoided or minimized, the BLM determines, in consultation with affected stakeholders, any appropriate measures to offset or mitigate these adverse impacts.

A.2.5.2.1 Avoidance and Minimization

The BLM's approach to mitigation first calls for avoidance of areas where there is a high potential for natural, visual, or cultural resource conflict (e.g., ecologically important and/or sensitive habitats. For the Solar Energy Program, the BLM proposes to accomplish this goal through the identification of extensive exclusions and incentivizing of development in SEZs (i.e., priority areas with low or relatively low resource conflict). Further, the BLM proposes to use landscape-scale ecological assessments and other natural, visual, and cultural resource screening factors in the proposed variance process to identify and determine whether to avoid core, sensitive, and/or intact landscapes outside of priority areas.

The BLM's approach to mitigation secondarily calls for the BLM to consider how best to minimize unavoidable impacts. For the Solar Energy Program, the BLM proposes to accomplish this goal by developing and employing programmatic and SEZ-specific design features that limit harm to sensitive natural, visual, and cultural resources. In addition, projects on BLM-administered lands will be required to follow all applicable federal, state, and local laws and regulations, such as the Endangered Species Act (ESA), which will result in additional measures that avoid and/or minimize resource impacts.

As described in Section A.2.4 of this appendix, the BLM proposes to establish a robust monitoring and adaptive management plan as part of its Solar Energy Program, the Solar LTMP. The BLM will use information derived from its monitoring efforts to make necessary adjustments to it solar energy-related avoidance and minimization strategies over time.

A.2.5.2.2 Offset of Unavoidable Impacts—Regional Mitigation Plans for SEZs

For those impacts that cannot be avoided or minimized, the BLM will consider the implementation of measures to offset (or mitigate) impacts with a goal of ensuring viability of resources over time. To help accomplish this goal in a streamlined and standardized way for SEZs, the BLM proposes to establish regional mitigation plans (see Section 2.2.2.2.3). As envisioned, regional mitigation plans will increase permit efficiencies and financial predictability for developers in SEZs by increasing certainty around mitigation requirements and costs.

Regional mitigation plans will address mitigation for a variety of resources impacted by development in SEZs such as biological resources, ecological resources, cultural resources, recreation resources, visual resources, and socioeconomic factors, as appropriate. Regional mitigation plans are expected to enhance the ability of state and federal agencies to invest in larger scale conservation and mitigation efforts through the pooling of financial resources and prioritization of investments. The BLM seeks to establish regional mitigation plans that result in equitable allocation of costs among developers proposing development in SEZs so as not to inadvertently dis-incentivize use of SEZs.

Impacts, and therefore mitigation requirements, for most proposed projects in variance areas are expected to be greater than those in SEZs (because SEZs are areas of low or relatively low resource conflict). The BLM expects to address any necessary mitigation for projects proposed in variance areas on a case-by-case basis without the benefit of a pre-determined mitigation strategy and the resulting efficiency and financial predictability. Where applicable, however, the BLM will use the objectives and priorities established in a regional mitigation plan for SEZs as a guide for mitigation requirements for projects proposed in variance areas.

The BLM has identified the following goals that it expects to pursue as it develops regional mitigation frameworks for SEZs:

- *Mitigation hierarchy* – Prioritize the consideration of avoidance and minimization strategies before assessing whether and to what extent it is appropriate to mitigate impacts;

- *Integration and consistency* – Address mitigation obligations at multiple levels concurrently (i.e., federal, state, and local) to avoid duplication and/or unintended consequences;

- *Repeatability* – Establish mitigation strategies that are replicable across the Solar Energy Program and adaptable to differences in SEZs, individual projects, and technologies;

- *Land acquisition* – Comprehensively evaluate land acquisition and long-term management strategies for both public and private lands to fully understand impacts on, for example, local jurisdictions and recreational opportunities, as well as regulatory challenges;

- *Restoration* – Allow for the restoration of degraded and previously disturbed public and private lands as appropriate to meet conservation objectives;

- *Fiscal sustainability* – Ensure adequate funding over time to achieve mitigation outcomes;

- *Fiduciary structure* – Employ transparent and accountable third-party-managed endowments to hold and manage regional mitigation funds and direct mitigation investments;

- *Combined investments* – Focus investments from a number of projects collectively to increase the likelihood of achieving an effective and enduring offset of impacts and to reduce overall cost;

- *Strategic prioritization* – Establish priority mitigation activities and locations based on, and consistent with, existing conservation objectives, resource management plans, and other Federal, state, and/or local goals;

- *Mitigation sustainability* – Provide solutions that are as enduring and long-lasting as the impacts; and

- *Monitoring and adaptive management* – Implement monitoring and adaptive management to verify that mitigation strategies are adequate relative to the impacts over time.

As part of the proposed Solar Energy Program, the Solar LTMP will be used to evaluate the effectiveness of mitigation strategies employed through regional mitigation plans (see Section A.2.4 of Appendix A). Regional mitigation plans will be subject to continued review and adjustment by the BLM and its partners to ensure conservation goals and objectives are being met. The BLM expects that future NEPA and planning analyses that support the identification of any new or expanded SEZs (see Section A.2.6 of this appendix) will also include the establishment of regional mitigation plans.

A.2.5.3 Regional Mitigation Plan Elements

Regional mitigation plans for SEZs will generally include the following seven elements.

A.2.5.3.1 Transparent and Legally Defensible Stakeholder Engagement Process

The BLM is committed to working with appropriate federal, state, and local agencies; tribes; and other stakeholders (e.g., solar developers, recreation interests, environmental organizations, and scientific and academic institutions, as well as the interested public) in developing regional mitigation plans. Involvement by diverse stakeholders and interested parties will assure full understanding of impacts and mitigation objectives. Further, stakeholders can share first-hand or historical knowledge about particular impacts and opportunities for mitigation that can enhance natural, cultural, and recreational landscapes. Specific opportunities for stakeholder involvement are outlined in the steps that follow and will be further explored and refined through the proposed pilot efforts.

The BLM may choose among several paths to engage stakeholders in building, testing, and implementing regional mitigation plans. For example, the BLM may hold open public meetings to solicit input on regional mitigation plan elements, pilot project efforts, or the future application of the framework. Dependant on context, BLM could also pursue regional mitigation planning as a component of ongoing land use planning and NEPA activities. Alternatively, the BLM may in some circumstances utilize an advisory group, subgroup, or chartered committee, consistent with the Federal Agency Committee Act (FACA).

Under FACA, any time a federal agency intends to establish, control, or manage a group that gives advice as a group and has at least one member who is not a federal, tribal, state, or local government employee, the agency must comply with FACA and the related administrative guidelines developed by the General Services Administration (GSA). For the BLM, additional requirements for administering advisory committees are found in 43 CFR Part 1784. The BLM charters its Resource Advisory Committees (RACs) and other advisory committees pursuant to the requirements of FACA and the BLM's Advisory Committee regulations.[6] In addition, the BLM is responsible under Executive Orders to conduct government-to-government consultation, including Guidelines for Conducting Tribal Consultation.[7] In the development of regional mitigation plans for SEZs, the BLM will work within the bounds FACA and all other requirements, actively engage RACs, and define specific opportunities formal and informal public comment.

6 See http://www.blm.gov/wo/st/en/prog/more/adr/natural_resources/faca/faca_apply_chart.html.

7 See http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/blm_handbook.Par.38741.File.dat/H-8120-1.pdf.

A.2.5.3.2 Baseline upon Which Unavoidable Impacts Are Assessed

As part of a regional mitigation plan, the analysis in the Solar PEIS and other sources of high-quality information are utilized to identify baseline resource conditions in SEZs. The BLM will coordinate its identification of baseline assessments with other federal, state, and local agencies such as the USFWS, state wildlife agencies, and State Historic Preservation Offices, and will identify opportunities for stakeholder engagement.

Data collected through the BLM's proposed Solar LTMP and annual reports from that process are expected to be instrumental in understanding baseline conditions for SEZs. In addition, the BLM expects to utilize information from other efforts, such as BLM Rapid Ecological Assessments, the California DRECP, BLM RMPs, Habitat Conservation Plans and Biological Opinions, State Wildlife Plans, and other plans or assessments. The BLM will incorporate new landscape-scale (and finer-scale, where appropriate) data as they become available to ensure that the established baseline reflects the best available information and changing conditions. Additional data collection for SEZs may be necessary as part of identifying a baseline.

Attributes that make up the baseline will include, but are not limited to, the ecological status of the landscapes to be developed; habitat quality and level of intactness; species occurrences, population status, and viability; presence/absence and abundance of rare, sensitive, endemic, threatened, or endangered species; status of aquatic, surface water, and groundwater resources; location of wildlife migratory corridors; connectivity of habitats; and ecological trends underway, such as those that may be attributed to climate change. Baseline information on nonbiological resources will also be collected as necessary to assess impacts on resources such as recreation and access.

A.2.5.3.3 Methodology for Assessing and Quantifying Unavoidable Impacts

In coordination with stakeholders, the BLM will establish a methodology to assess and quantify unavoidable impacts associated with future development in SEZs. Best available scientific techniques will be employed to assess impacts. Consideration will be given to cumulative impacts and the temporal nature of the impacts. Impacts to be assessed in regional mitigation plans will go beyond biological and ecological impacts to include, for example, cultural resources, scenic resources, and socioeconomic factors. Through the proposed pilot efforts, the BLM will seek to establish a single and transparent methodology that would be used to quantify impacts across all SEZs in the Solar Energy Program.

A.2.5.3.4 Methodology for Determining Mitigation Obligations or Costs for Individual Projects

The BLM will employ transparent and standardized methods to value impacts and translate those impacts into mitigation obligations or costs (e.g., a cost per acre mitigation fee). Coordination with other federal, state, and local permitting agencies will be required so that

mitigation obligations at all levels work together and are not duplicative. Through the proposed pilot efforts, the BLM will seek to establish a consistent method for valuing impacts across all SEZs in the Solar Energy Program. Through the pilot, the BLM will also seek to develop a framework that details what activities will be considered and how the specific costs will be assigned. This may include, but is not limited to, consideration of average costs for land protection, funding for ongoing management needs, administrative costs, and performance bonding. The BLM would formalize the framework through an appropriate administrative process (e.g., rulemaking and/or land use planning).

For solar projects in both SEZs and variance areas, it is the responsibility of a developer to undertake any necessary mitigation and monitoring. The BLM expects that mitigation costs in SEZs will be less than those in variance areas because SEZs will generally consist of areas with low or relatively low resource conflicts. Costs are also expected to be reduced in SEZs due to the ability to pool investments for mitigation and monitoring and coordinate with other federal, state, and local agencies to maximize partnerships and avoid duplication.

A.2.5.3.5 A Structure to Hold and Apply Mitigation Investments

In developing a regional mitigation plan, the BLM will identify and establish a structure to hold and apply for mitigation investments made for solar energy development in SEZs. A third party with fiduciary responsibility (and demonstrated fiduciary experience) will be engaged to hold, manage, and allocate mitigation investments per the established regional objectives in the regional mitigation plan (see below). This third party may be locally (i.e., local land trust), regionally, or nationally based. In identifying a third-party fiduciary structure, the BLM will seek to ensure that mitigation investments are held in a manner that allows for the accrual of interest and that the funds required for meeting mitigation obligations are permanently restricted to achieving the conservation or other objectives required under those mitigation obligations.

A.2.5.3.6 Regional Objectives Regarding Where and How Mitigation Investments Will Be Made

The BLM will establish regional objectives to direct and prioritize where and how mitigation investments will be made. Regional objectives will be developed in conjunction with federal, state, and local agencies; tribes; and other stakeholders and interested parties, including the interested public. In establishing regional objectives, the BLM will employ scientifically accepted tools and rely heavily on best available information in existing documents such as Habitat Conservation Plans, State Wildlife Action Plans, and BLM Resource Management Plans. Regional objectives will also be informed by output from the BLM's proposed Solar LTMP regarding the level of success of previously implemented mitigation actions.

Regional objectives will be set at the appropriate scale. Proximity to impacts in SEZs will not be a limiting factor in identifying mitigation objectives and possible investments. Rather, the BLM will give priority to sites that present the best options for successful mitigation and conservation benefits (exceptions may include impacts on groundwater where mitigation

investments would typically be limited to the affected basin and/or target aquifer). In order to retain manageability, the BLM will give priority to consideration of geographic scales in the range of 2–3 million acres (8,000–12,000 km^2) as an appropriate scope for regional mitigation planning.

In meeting regional objectives, regional mitigation plans will give consideration to the full range of mitigation tools available to the agency including but not limited to land acquisition, mitigation banking, withdrawing BLM-administered lands from other uses, changing land designations or uses, and restoration and enhancement activities. Through the proposed pilot efforts, the BLM will investigate further the regulatory authority associated with such tools. In establishing mitigation priorities, the BLM will give consideration to acquiring, protecting, and/or restoring areas or resources that have one or more of the following attributes:

- Surrounding land uses are likely to enhance mitigation benefits over time.
- Biotic factors, climatic factors, or physical gradients will allow adaptation to changing conditions.
- Areas can provide movement corridors between ecologically defined and effectively protected landscape units or habitat blocks.
- Areas feature desert aquatic and riparian habitats supplied by perennial, protected sources of water.
- Areas feature distinct or unique assemblages of species or communities or locations that provide valuable ecosystem services (e.g., rare plant assemblages, desert washes);
- Sites feature high-quality habitat for, and healthy populations of, both target species (especially special status species) and nontarget species;
- Areas contribute to the permanence of conservation protections, and offer assured long-term protection of conservation values.

A.2.5.3.7 Monitoring and Adaptive Management

Mitigation investments will need to be measurable to support monitoring and adaptive management activities. The BLM's proposed Solar LTMP (see Section A.2.4 of this appendix) will develop management questions and conceptual models to evaluate the effectiveness of mitigation investments employed through regional mitigation plans. Through Solar LTMP data analysis and annual reports, the BLM will ensure mitigation investments being undertaken through regional mitigation plans are adequate relative to impacts over the life of the impacts. The BLM will consider ways to track and report the effectiveness of mitigation investments and develop mechanisms to feed information back into regional mitigation plans to assure that the actions taken and fees collected appropriately offset impacts.

A.2.5.4 Building and Testing the Framework for Regional Mitigation Plans for SEZs

The BLM is proposing to undertake the framework outlined above and develop a regional mitigation plan for one or more of the proposed SEZs. The regional mitigation plan pilot effort will commence in summer 2012. In undertaking a pilot (or pilots), the BLM will work with key stakeholders and cooperating agencies with experience in developing and implementing mitigation plans.

Through the pilot, the BLM hopes to answer the following questions:

- Which methodologies or mechanisms best suit BLM's needs to assess impacts and translate impacts into dollars?
- What are the best examples of third-party fiduciary structures to manage and deliver mitigation investments?
- What is the array of "tools" available to the BLM to accomplish mitigation on the ground, including a mechanism to ensure enduring protection for mitigation actions on public lands?
- How can the pooling of dollars for mitigation and monitoring in SEZs help reduce overall costs to developers?
- What are the best methods to integrate regional mitigation plans into the Solar LTMP?

The BLM will select a project manager to oversee the regional mitigation plan pilot(s). An IDT composed of staff from BLM's Washington Office, National Operations Center, and State and Field Offices and other DOI agencies will be formed to implement the pilot(s). The IDT will include staff with experience in developing mitigation plans and knowledge of resources in the eco-region in which the pilot will take place. The IDT will perform baseline research and data compilation and engage appropriate stakeholders such as Resource Advisory Councils, cooperating agencies, state and local agencies, and tribes. The IDT will organize and lead workgroups with participation from stakeholders with a goal of framing and developing the following elements of the regional mitigation plan:

1. Impact assessment methods;
2. Quantification of mitigation obligations or costs
3. Identification and selection of a third party with fiduciary responsibility;
4. Development of regional objectives to direct mitigation investments; and

5. Thresholds or triggers that indicate when changes in timing, frequency, and location of mitigation investments is needed.

Results of the pilot will aid the BLM in refining the framework for regional mitigation plans and associated plan elements. Lessons learned from the pilot will allow for replication of a sound process across the remainder of the SEZs and will inform future BLM mitigation policy and/or directives for the Solar Energy Program. The BLM will make information about the pilot(s) available through the Solar PEIS project Web site (http://solareis.anl.gov). This will include notification of opportunities for public and stakeholder involvement.

A.2.6 Proposed Solar Energy Zone Identification Protocol

The SEZs being carried forward in the Final Solar PEIS identify approximately 285,000 acres (1,153 km^2) across the six-state study area. In addition, the BLM has made a commitment to continue processing pending applications. Although this is a strong start in facilitating utility-scale solar energy development on public lands, the BLM intends to identify new and/or expanded SEZs as part of the Solar Program to enhance the opportunities for development of solar energy. The BLM believes that establishing a feasible process to identify new SEZs is an essential element of its overall approach to solar energy development. New or expanded SEZs must be anticipated and planned for ahead of need so as not to delay solar energy development. Successful identification of new or expanded SEZs will require meaningful participation by the BLM in planning processes for both generation and transmission.

New or expanded SEZs will be identified in the context of existing solar market conditions, existing and planned transmission systems, and new (or existing) state or federal policies affecting the level and location of utility-scale solar energy development. The BLM will assess the need for new or expanded SEZs at least once every 5 years in each of the six states covered by the Solar PEIS. The process to identify new or expanded SEZs will be open and transparent, with opportunities for substantial involvement of multiple stakeholders. The BLM will identify new or expanded SEZs at the state or field office level as an individual land use planning effort or as part of an ongoing land use plan revision. In all cases, the planning of new or expanded SEZs will tier from the Solar PEIS and utilize information carried forward from the PEIS to assist in the analyses. It is BLM's goal to complete the work to identify new SEZs and amend applicable land use plans within 12 to 18 months of initiating such efforts.

The BLM has initiated efforts to identify new SEZs in the states of California, Arizona, Nevada, and Colorado through ongoing state-based efforts (see Section 2.2.2.2.6 for more information) and anticipates identifying new or expanded SEZs in the remaining states in the near future. This ongoing work makes effective use of existing collaborative efforts and is expected to result in new or expanded SEZs in these planning areas in the near term if appropriate.

This section describes a step-by-step process that the BLM expects to use in the future when considering whether to identify new or expanded SEZs. SEZs should be relatively large areas that provide highly suitable locations for utility-scale solar development: locations where solar development is economically and technically feasible, where there is good potential for connecting new electricity-generating plants to the transmission distribution system, and where there is generally low resource conflict.

The four steps described below highlight a sequential process that first assesses demand for additional acres in SEZs, followed by the identification of locations where solar development is economically and technically feasible, and then in these larger regions applies relevant environmental, cultural, and other screening criteria to find potential SEZs with low conflict. The BLM will subsequently use the NEPA and planning processes to make finer-scale adjustments and decisions regarding SEZs. The four steps are as follows:

- Assess the demand for new or expanded SEZs;
- Establish technical and economic suitability criteria;
- Apply environmental, cultural, and other screening criteria; and
- Analyze proposed SEZs through a planning and NEPA process.

A.2.6.1 Assess the Demand for New or Expanded SEZs

The BLM expects that it will assess the demand for new or expanded SEZs at least once every 5 years in each of the six states covered by the Solar PEIS. The assessment of demand may take place as part of the regular land use planning process or as a separate effort to determine the role BLM-managed lands should play in broader energy and climate goals. While federal, state, tribal, and local stakeholder involvement will be essential to the process, BLM State Offices will ultimately be responsible for making the determination that additional SEZ acreage is needed. Acknowledging that significant changes can occur in the interim between assessments, the BLM will also provide for an assessment triggered by a petition process.

Petitions for new or expanded SEZs must be submitted in writing to the appropriate BLM State Director with documentation supporting the request. Petitions must have a rational basis and should be linked to factors such as policy, environmental, and/or market changes (e.g., increase in state or national renewable standards, approval of a foundational transmission line, economic development, population growth, or availability of financial incentives). Developers, environmental stakeholders, local and state governments, industry associations, and others may collectively or individually petition the BLM to consider specific areas for new or expanded SEZs. Petitioners may also request changes in already identified SEZs, such as eliminating or revising boundaries due to changes in status of species or critical habitat under the ESA.[8] In addition to the petition process, the public may also raise the need for new or modified SEZs through the scoping process for individual land use plans.

When considering the demand for new or expanded SEZs, the BLM will take into consideration relevant policy goals and trends in the solar market. The BLM will rely on outside expert consultation regarding electricity demands, markets, and renewable energy policies such as the DOE and state energy offices. Utility-approved plans, state public utility forecasts, and regional planning outcomes such as those originating with the California Independent System Operator and the Western Electricity Coordinating Council can all provide useful inputs into the BLM's determination of demand for additional SEZ acreage. The BLM will also consider the availability of land in existing SEZs when it evaluates the need for new or expanded SEZs. The BLM's assessment of demand may require the development of new state-based Reasonably Foreseeable Development Scenarios that incorporate new federal or state policies affecting projections.

[8] Changes to SEZs established by the Solar PEIS ROD must be submitted through the State Director to the BLM Washington Office for the Director's concurrence.

A.2.6.2 Establish Technical and Economic Suitability Criteria

In addition to considering the demand for solar energy across a state or region, the BLM's process to identify new or expanded SEZs will take into account technological advances in solar energy generation systems and/or transmission infrastructure, energy load centers and associated flow, existing and planned transmission lines, and any known constraints to development. These additional factors will influence the decision regarding which general region will be chosen for new or expanded SEZs.

A number of factors determine the technical and economic suitability of an area for utility-scale solar energy development, including the quality of the solar resource, terrain, and proximity to existing load and infrastructure. These factors may vary by state and/or region and will continue to evolve over time. As part of its SEZ identification process, the BLM will work with outside experts, industry and transmission planning organizations, and other stakeholders to establish and apply appropriate technical and economic suitability criteria.

A.2.6.2.1 Size Threshold

An SEZ should generally encompass an area large enough to accommodate multiple utility-scale solar projects, provide flexibility for siting, and provide opportunities for shared infrastructure. SEZs on public lands should also be large enough to generate ample quantities of solar-generated power to justify the effort and expense required to determine whether the area is well suited for solar development. Smaller areas of BLM-administered lands that are located adjacent to private, state, or other federal lands that are suitable for solar development may, however, be appropriate for consideration as SEZs if they can be used in conjunction with adjacent areas.

A.2.6.2.2 Solar Insolation Level

Solar insolation levels in areas identified for new or expanded SEZs will typically be high, thus allowing for optimum power production. Higher insolation values provide significant benefits for solar generation facilities. For instance, a reduction of 1 kWh/m^2/day in insolation is equivalent to approximately a 10% reduction in efficiency and, in turn, a proportional increase in costs and land use footprint (due to the need for additional solar collection equipment to provide the same quantity of energy).

Under BLM's proposed Solar Energy Program, areas with direct normal solar insolation levels less that 6.5 kWh/m^2/day would not be available for individual applications (i.e., they would be excluded). However, in light of expected technological advances, shifting market conditions, and evolving state and Federal policies, the BLM will allow new SEZs in areas with insolation levels lower 6.5 kWh/m^2/day as appropriate.

Different types of insolation are most relevant to the different large-scale solar generating technologies. For concentrating solar technologies, direct normal insolation is most pertinent,

while for photovoltaic (PV) systems, global tilt insolation is the appropriate measure of the solar resource. As part of the process to identify new or expanded SEZs, the BLM may need to consider both the direct normal insolation and the global tilt insolation depending on the technologies being contemplated for a given SEZ.

A.2.6.2.3 Slope Threshold

Most solar generating technologies must be sited on relatively flat ground to ensure that the solar collectors can utilize the solar resource effectively. Depending on the technology, the required slope can range from less than 2% to more than 5%, although lower slopes are generally better for siting solar generation. Under BLM's proposed Solar Energy Program, areas with slopes greater than 5% would not be available for individual applications (i.e., they would be excluded).

As part of the process to identify new or expanded SEZs, some flexibility in applying the slope criterion may be appropriate, particularly for PV or dish engine technologies that are more tolerant of lands with steeper slopes. In considering new or expanded SEZs, areas with higher slopes should be otherwise well suited for development. It is unlikely that lands with slopes of greater than 10% would be technically viable for utility-scale solar production.

A.2.6.2.4 Load Areas To Be Served

When considering the appropriate locations for new or expanded SEZs, the BLM will determine the load areas likely to be served by needed solar generation. The BLM should rely on outside expert consultation regarding electricity demands, markets, and renewable energy policies (e.g., DOE, state energy offices). The BLM should also consider relevant Federal and state policy goals and trends, such as possible retirement of generating facilities and/or state Renewable Portfolio Standard policy (or policies). For example, the Renewable Portfolio Standard in a given state may have been met, and new solar development would be expected to serve demand in another state. The location for new SEZs would therefore have to consider existing transmission lines and capacity available to move new generation to load out of state. Consideration would also have to be made for the elements of the importing state's Renewable Portfolio Standard policy (or policies).

A.2.6.2.5 Infrastructure Access

As part of the identification of new or expanded SEZs, the BLM will consider proximity to existing infrastructure, such as transmission lines, utility corridors, roads, and a suitable workforce. Where SEZs can be located close to existing infrastructure, environmental disturbance may be minimized through use of the existing facilities (in some cases, however, transmission lines may be sited in environmentally sensitive areas that are not suitable for locating SEZs). Use of existing infrastructure may also reduce costs of construction and mitigation, making locations close to existing and useable infrastructure attractive to developers.

New or expanded SEZs should be located in areas sufficiently close to load or in areas where transmission can be reasonably expected to be available in time to serve the quantity of generation planned. Consideration of such factors will require meaningful participation by the BLM in planning processes for transmission. The BLM will consult with state and regional transmission planning and coordination authorities, state energy offices, and transmission system operators to evaluate available capacity on existing and proposed lines and to discuss other potential transmission-related barriers.

In considering potential locations for new or expanded SEZs, the BLM should catalog all existing and proposed transmission lines serving an area in relation to the power generation potential from a proposed SEZ. Consideration should also be given to foreseeable changes in load such as retirement of generating facilities. Where new transmission lines are needed, they should be planned to utilize existing ROWs or designated utility corridors to the extent practicable.

It is important to note that efforts to assess the feasibility and cost of supplying transmission to a specific area have a high degree of uncertainty, because new transmission lines are proposed, constructed, and added to the existing transmission grid over time, and because the available capacity on the grid also changes as demand increases and new power sources are added over time. Due to the remote locations of many prime solar resource areas, transmission upgrades and additions will generally be needed to connect those locations to the grid.

The ability to utilize existing paved roads for access to SEZs can also reduce impacts associated with development; therefore, SEZs should be located adjacent to major paved roads where possible. For potential SEZs where existing paved roads are located some distance away, existing dirt roads should be upgraded for site access to the greatest extent possible in order to minimize land disturbance. Finally, the proximity of the SEZ to a potential workforce should be considered to promote sustained workforce success in the SEZ region.

A.2.6.3 Apply Environmental, Cultural, and Other Screening Criteria

A.2.6.3.1 Program Exclusion Criteria

In an attempt to identify lands with low resource conflicts, BLM State and field offices will consider the presence of program exclusions established through the Solar PEIS on potential SEZ lands. As part of the Final Solar PEIS, the BLM identified a comprehensive list of lands that have been determined to be unsuitable for utility-scale solar development ROWs (Section 2.2.2.1).

A.2.6.3.2 Relevant Land Use Plan Decisions

BLM state and field offices undertaking efforts to identify new or expanded SEZs will consider all relevant decisions in existing land use plans (e.g., ROW avoidance and exclusion

areas, timing restrictions). Although amendment of existing land use plan decisions may be necessary as part of identifying new or expanded SEZS, such decisions serve as a valuable screen for potential conflicts.

A.2.6.3.3 Coordination and Outreach

In order to understand potential resource conflicts and opportunities and/or barriers for solar development, BLM state and field offices undertaking efforts to identify new or expanded SEZs will coordinate with appropriate federal, state, and local agencies, and tribes (including, but not limited to, the agencies described below). The BLM also may decide to reach out to the local public and other stakeholders such as local sportsman groups. Such coordination and outreach would likely result in the development of locally relevant screening criteria to be applied in the identification of new or expanded SEZs.

The BLM will consult with state and local (county and/or municipal) governments to identify opportunities for new or expanded SEZs and to consider consistency with officially adopted local plans and policies (e.g., comprehensive land use plans, open space plans, conservation plans) and permit requirements (e.g., special use permits). The BLM will consult with state resource management agencies to discuss potential resource conflicts. The BLM will engage in government-to-government consultation with tribes to identify traditional cultural properties and sacred sites with areas related to new or expanded SEZs. The BLM will consult with appropriate land management agencies for consideration of areas close to special designations such as the National Parks, National Refuges, and National Forests. The BLM will consult with DoD for consideration of impacts on military installations and operations. Such consultations may result in agreements not to locate SEZs near specific units, based on an agency's assessment of potential adverse impacts on those units.

A.2.6.3.4 Landscape-Scale Information

The BLM will use landscape-scale information to identify, and to exclude from SEZs, areas of high ecological value or importance (e.g., BLM's rapid ecological assessment, California's DRECP, The Nature Conservancy's eco-regional assessments, and state-level crucial habitat assessment tools). For example, in areas with pre-existing landscape-scale conservation plans, such as the DRECP in California, future SEZs will not be considered in areas needed to achieve biological goals and objectives established in the plan. Other types of areas to screen for based on landscape-scale information may include areas with significant populations of sensitive, rare, and special status species or unique plant communities, important biological connectivity areas, designated wildlife habitat management areas, and areas with high concentrations of ethno-botanical resources of importance for Native American use. Potential landscape-scale information should be evaluated in coordination with relevant federal, state, and local resource management agencies and Tribes.

A.2.6.3.5 Degraded, Disturbed, or Previously Disturbed Sites

In identifying potentially suitable lands for SEZs, BLM state and field offices will seek opportunities to locate new or expanded SEZS in degraded, disturbed or previously disturbed areas. Examples include, but are not limited to, the following:

- Lands that have been mechanically altered such as fallowed agricultural lands;
- Lands that have been "type-converted" from native vegetation through plowing, bulldozing, or other mechanical impact, often in support of agriculture or other land cover change activities (e.g., mining, clearance for development, or heavy off-road vehicle use);
- Brownfields and other contaminated or previously contaminated sites identified by the Environmental Protection Agency's RE-Powering America's Land Initiative (http://www.epa.gov/renewableenergyland);
- Idle or underutilized industrial sites;
- Lands adjacent to urbanized areas and/or load centers;
- Areas repeatedly burned and invaded by fire-promoting non-native grasses where the probability of restoration is determined to be limited; and
- Areas where co-location of solar energy development with other energy development may be feasible (e.g., wind or oil and gas development).

Amendment of existing land use plan decisions (e.g., ROW avoidance and exclusion areas) may be necessary to allow for new or expanded SEZs on degraded, disturbed, or previously disturbed areas. Sources of information on degraded, disturbed, or previously disturbed areas should include (1) landscape-scale information and landscape-scale ecological assessments (e.g., landscape conservation cooperatives, rapid ecological assessments, and state-level crucial habitat assessment tools), which identify converted or highly degraded lands on BLM-administered and adjacent federal and nonfederal lands; (2) coordination with the EPA and relevant state agencies that catalog degraded, disturbed, or previously disturbed sites; and (3) outreach to local communicates and the public regarding possible degraded, disturbed, or previously disturbed sites.

A.2.6.3.6 Opportunities to Combine Other Federal and Nonfederal Lands

As part of the SEZ identification process, the BLM will take into account opportunities to partner with adjacent federal and nonfederal landowners (e.g., private, state, tribal, or DoD-withdrawn lands). For example, small SEZs may be appropriate on BLM-administered lands when they are located adjacent to degraded, disturbed, or previously disturbed private lands. This combination of BLM-administered and nonfederal lands could allow for a combined

use area, allowing for the expansion of renewable energy development onto well-suited adjacent lands.

A.2.6.3.7 Information from BLM Monitoring Efforts

As part of the SEZ identification process, the BLM will review and consider information gathered through its proposed long-term monitoring and adaptive management program (see Section A.2.4). Information gathered through monitoring studies will help the BLM regularly evaluate resource conditions, detect change, and augment its knowledge of potential resource conflicts associated with solar energy development. This information will be used to inform the identification of new priority areas for utility-scale solar development. In addition, the BLM has expanded its knowledge of areas suitable/not suitable for development through the evaluation of individual solar energy ROW applications. Areas eliminated from ROW applications due to resource conflicts (e.g., rare vegetation or desert washes) may provide additional screening criteria for new or expanded SEZs.

A.2.6.4 Analyze Proposed SEZs through a Planning and NEPA Process

The BLM will publish a Notice of Intent (NOI) in the *Federal Register* stating its intent to prepare a Land Use Plan amendment (or amendments) to identify a new or expanded SEZ or multiple SEZs and prepare the associated NEPA documentation. The NOI will also begin the formal scoping process (40 CFR 1501.7). Through the scoping process, the BLM will solicit additional input on potential SEZs. The public will be invited to nominate proposed SEZs through the scoping process that meet the objectives of the planning effort. Based on scoping, the BLM will identify a potential SEZ or multiple SEZs or SEZ configurations to be analyzed through the planning and NEPA process. The BLM will document the results of its scoping in a publicly available scoping report (43 CFR 1610.2(d)).

When the BLM is preparing NEPA analyses for new SEZs, its goal will be to produce documents with comprehensive analyses of resources at a level of detail sufficient to allow for tiering of future solar projects within the SEZ. Analysis of SEZs will also include appropriate consultations pursuant to the ESA and the NHPA. The potential impacts associated with the development of transmission interconnection and other infrastructure to support the establishment of an SEZ will be considered as part of the NEPA review for the SEZ. The BLM will also seek opportunities to designate any necessary utility corridors that would support the establishment of new or expanded SEZs in a combined planning effort. The BLM will make the draft land use plan amendment and draft NEPA document available for a 90-day public comment period (43 CFR 1610.2(e)). Following the preparation of a proposed land use plan amendment and final NEPA document, and after reviewing and resolving any protests, the BLM would issue a decision about whether to amend affected land use plans.

Through the planning and NEPA process, the BLM will refine SEZ boundaries and may establish SEZ-specific management prescriptions based on resource-specific considerations. Chapter 5 of the Draft Solar PEIS as updated in the Final Solar PEIS includes a comprehensive

description of the impacts of constructing and operating solar energy generation facilities and related infrastructure and possible mitigation measures in the categories below. This information will be used as a guide to inform the analysis of SEZs. The categories are as follows:

- Lands and realty;
- Specially designated areas and lands with wilderness characteristics;
- Livestock grazing;
- Wild horses and burros;
- Wildland fire;
- Recreation;
- Military and civilian aviation;
- Geologic setting and soil resources;
- Minerals;
- Water resources;
- Ecological resources;
- Vegetation and plant communities;
- Wildlife;
- Aquatic biota;
- Special status species;
- Air quality and climate;
- Visual resources;
- Acoustic environment;
- Paleontological resources;
- Cultural resources and Native American concerns;
- Socioeconomics;

- Environmental justice; and

- Cumulative impact considerations.

A.2.6.4.1 SEZ-Specific Design Features and Mitigation Plans

Establishing SEZs in areas where avoidance of sensitive resources is possible is generally the most effective means to ensure resource protection. When complete avoidance of all sensitive resources is not possible, it may be practical to include some areas within the boundaries of an SEZ, with requirements that no disturbance occur in these areas (i.e., solar facilities would be required to be constructed outside of such areas). To avoid possible isolation and/or fragmentation of resources, however, the BLM will generally endeavor to avoid designating SEZs with significant numbers and/or acreage of exclusion areas within them.

Design features can be effective in minimizing potential resource impacts in new SEZs. In addition to the programmatic design features to be established through the Solar PEIS ROD, the BLM may identify and analyze additional SEZ-specific design features as necessary through its planning and NEPA processes. For those impacts expected to result from the build-out of a new SEZ that cannot be avoided or minimized, the BLM will determine appropriate mitigation actions to offset impacts. New SEZ proposals should include an accompanying regional mitigation plan developed through the framework identified in the Final Solar PEIS (see Section A.2.5).

A.2.7 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this Final Solar PEIS. It is likely that at the time of publication of this Final Solar PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this Final Solar PEIS.

BLM (Bureau of Land Management), 2011, *Bureau of Land Management Assessment, Inventory, and Monitoring Strategy for Integrated Renewable Resources Management*, National Operations Center, Denver, Colo., Aug. Available at http://jasonjtaylor.com/pdf/publications/toevs%20et%20al%202011%20-%20BLM-AIM_Strategy_August2011.pdf.

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APPENDIX B:

APPROVED AND PENDING SOLAR APPLICATIONS

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APPENDIX B:

APPROVED AND PENDING SOLAR APPLICATIONS

B.1 BACKGROUND

This appendix presents information on the approved and pending solar applications on U.S. Department of the Interior (DOI) Bureau of Land Management (BLM) administered lands. This information is provided in support of the Final *Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States* (Solar PEIS). This appendix has been completely revised and the information presented here replaces information provided in Appendix B of the Draft Solar PEIS and in Appendix A of the Supplement to the Draft Solar PEIS.

As of May 31, 2012, the BLM had approved 11 utility-scale solar projects on public lands and 5 linear rights-of-way (ROWs) that enabled development of solar energy projects on private lands. The total capacity for the approved solar projects on BLM-administered lands is 4,512 MW, with an associated BLM land area of 44,025 acres (178 km^2). These applications are listed in Table B-1.

The BLM defines "pending" applications as any applications filed within proposed variance and/or exclusion areas before the publication of the Supplement to the Draft Solar Programmatic Environmental Impact Statement (PEIS) (October 28, 2011), and any applications filed within proposed solar energy zones (SEZs) before June 30, 2009. The BLM has cataloged 91 first-in-line solar applications that meet the definition of pending; as of May 31, 2012, 13 of these first-in-line pending applications had been closed (denied or withdrawn). The applications are listed in Table B-2 and summarized in Table B-3.

The total acreage of BLM-administered lands covered by active first in-line pending applications is approximately 626,000 acres (2,533 km^2), with an estimated total capacity of approximately 33,000 MW. This equates to an average land use of about 20 acres/MW (0.08 km^2/MW) for all of the pending applications combined. This land use is greater than the land use requirements assumed in the Solar PEIS (i.e., 5 acres/MW [0.02 km^2/MW] for parabolic trough facilities; 9 acres/MW [0.04 km^2/MW] for all other facilities), reflecting the fact that applicants often request more acreage to allow flexibility in project design and to avoid lands where resource conflicts might exist within the ROW application area.

The BLM will process second-in-line and subsequent applications as pending applications if they otherwise meet the criteria for pending and the corresponding first-in-line application is closed (denied or withdrawn). While the BLM tracks second-in-line and subsequent applications, they are not included in Table B-2 to avoid double counting of acreage and megawatts.

TABLE B-1 Approved Solar Applications on BLM-Administered Lands as of May 31, 2012

Project Name [Developer] (Location)	Technology	Capacity (MW)	BLM Acreage	Approval Date
Imperial Valley Solar Project[a] *[Tessera Solar North America] (Imperial County, CA)*	Originally planned as solar engine	709	6,360	Oct. 5, 2010
Lucerne Valley Solar Project [Chevron Energy Solutions] (San Bernardino County, CA)	Thin film photovoltaic (PV)	45	516	Oct. 5, 2010
Silver State Solar Energy Project (North) [First Solar, Inc.] (Clark County, NV)	Thin film PV	50	618	Oct. 12, 2010
Ivanpah Solar Electric Generating System (SEGS) [BrightSource Energy] (San Bernardino County, CA)	Power tower	370	3,472	Oct. 17, 2010
Calico Solar Energy Project[b] [acquired by K Road Power] (San Bernardino County, CA)	Originally solar dish; changing to PV	663.5	4,604	Oct. 20, 2010
Blythe Solar Power Project[b] [Solar Millennium, LLC] (Riverside County, CA)	Originally parabolic trough; changing to PV	1,000	7,025	Oct. 22, 2010
Genesis Solar Energy Project [Solar Millenium, LLC] (Riverside County, CA)	Parabolic trough	250	4,640	Nov. 4, 2010
Amargosa Farm Road Solar Project [Solar Millennium, LLC] (Nye County, NV)	Parabolic trough	464	4,350	Nov. 15, 2010
Crescent Dunes Solar Project [SolarReserve, LLC] (Nye County, NV)	Power tower	110	1,600	Dec. 20, 2010
Abengoa Mojave Solar [Mojave Solar] (Riverside County, CA)	Parabolic trough	250	0 (connected action)[c]	July 11, 2011
C Solar South [LightSource Renewables] (Imperial County, CA)	Thin film PV	200	0 (connected action)	July 14, 2011

TABLE B-1 (Cont.)

Project Name [Developer] (Location)	Technology	Capacity (MW)	BLM Acreage	Approval Date
Desert Sunlight Solar Farm [First Solar Development, Inc.] (Riverside County, CA)	Thin film PV	550	4,165	Aug. 9, 2011
C Solar West [LightSource Renewables] (Imperial County, CA)	Thin film PV	250	0 (connected action)	Aug. 23, 2011
Rice Solar Energy [Rice Solar Energy, LLC] (Riverside County, CA)	Power tower	150	0 (connected action)	Dec. 8, 2011
Sonoran Solar Project [NextEra Energy Resources, LLC] (Maricopa County, AZ)	PV	300	4,000	Dec. 20, 2011
Centinela Solar Energy Project [Centinela Solar Energy, LLC] (Imperial County, CA)	PV	275	0 (connected action)	Dec. 28, 2011

[a] Authorization terminated at the request of the developer.

[b] Proposed technology change by developer to PV or partial PV.

[c] Connected actions are projects that enable development on private lands, where the BLM has an off-site permitting action on adjacent BLM-administered public lands (e.g., proposed transmission lines cross BLM-administered public lands).

TABLE B-2 First-in-Line Pending Solar Applications on BLM-Administered Lands[a,b]

Serial Number	Customer Name (Project Name and/or Geographic Area)	Application Received	Capacity (MW)	BLM Acreage	Application Closed as of May 31, 2012?	Planned Technology[c]	Field Office
AZA 034184	Boulevard Assoc., LLC (Aguila)	June 26, 2007	500	7,335	No	CSP/trough	Hassayampa
AZA 034186	Boulevard Assoc., LLC (Burnt Mountain/Big Horn)	June 26, 2007	500	5,912	No	CSP/trough	Hassayampa
AZA 034187	NextEra/Boulevard Assoc., LLC (Sonoran Solar)	June 28, 2007	500	2,013	No	PV	Lower Sonoran
AZA 034200	NextEra/Boulevard Assoc., LLC (Mountain Spring)	June 22, 2007	250	6,705	No	CSP/trough	Kingman
AZA 034321	AREVA Solar AZ II, LLC (Ausra Palo Verde)	Oct. 1, 2007	400	1,867	No	CSP/CLFR	Hassayampa
AZA 034335	Boulevard Assoc., LLC (Bouse)	June 8, 2007	500	24,221	No	CSP/trough	Lake Havasu: Yuma
AZA 034357	First Solar (Gila Bend)	Nov. 6, 2007	500	6,003	No	PV	Lower Sonoran
AZA 034358	First Solar (Saddle Mountain)	Nov. 6, 2007	300	5,997	No	PV	Lower Sonoran
AZA 034416	Pacific Solar Invst., Inc. (Iberdrola) (Eagletail)	Dec. 2, 2007	1,500	26,082	No	CSP/trough	Yuma
AZA 034424	Pacific Solar Invst., Inc. (Iberdrola) (Big Horn)	Dec. 4, 2007	300	7,240	Yes (closed March 30, 2012)	CSP	Hassayampa
AZA 034425	Pacific Solar Invst., Inc. (Iberdrola) (Hyder)	Dec. 7, 2007	350	5,795	No	CSP/trough	Lower Sonoran: Yuma
AZA 034426	Pacific Solar Invst., Inc. (Iberdrola) (Ranegras)	Dec. 2, 2007	2,000	25,860	No	CSP/trough	Yuma

TABLE B-2 (Cont.)

Serial Number	Customer Name (Project Name and/or Geographic Area)	Application Received	Capacity (MW)	BLM Acreage	Application Closed as of May 31, 2012?	Planned Technology[c]	Field Office
AZA 034427	Pacific Solar Invst., Inc. (Iberdrola) (La Posa Solar Thermal)	Sept. 6, 2007	2,000	38,212	No	CSP/trough	Yuma
AZA 034540	Horizon Wind Energy, LLC (Horizon Aguila)	March 4, 2008	250	11,535	No	CSP/trough	Hassayampa
AZA 034554	Nextlight Renewable Power, LLC (Quartzite)	March 26, 2008	500	20,699	No	CSP/trough	Yuma
AZA 034560	Nextlight Renewable Power, LLC (Vicksburg)	March 26, 2008	500	15,040	No	CSP/trough	Yuma
AZA 034566	Nextlight Renewable Power, LLC (Centennial)	March 26, 2008	500	13,428	No	CSP/trough	Yuma
AZA 034568	Nextlight Renewable Power, LLC (Palomas)	March 26, 2008	500	20,165	No	CSP/trough	Yuma
AZA 034665	Solar Reserve, LLC (Black Rock Hill)	May 27, 2008	600	5,600	No	CSP/tower	Yuma
AZA 034666	Solar Reserve, LLC (Quartzsite)	May 27, 2008	100	2,013	No	CSP/tower	Yuma
AZA 034668	Solar Reserve, LLC (Agua Caliente)	May 27, 2008	600	5,678	No	CSP/tower	Yuma
AZA 034737	Arizona Solar Invst., Inc. (Haraquahala)	July 10, 2008	250	14,047	No	PV	Hassayampa
AZA 034739	IDIT, Inc. (Little Horn)	July 9, 2008	1,000	12,291	No	CSP/trough	Yuma
AZA 034754	Horizon Wind Energy, LLC (Wenden)	March 4, 2008	250	28,760	No	CSP/trough	Lake Havasu
AZA 034774	IDIT, Inc. (Dendora Valley)	Aug. 12, 2008	250	14,765	No	PV	Lower Sonoran
AZA 034797	LSR Jackrabbit, LLC (LSR Jackrabbit)	Aug. 27, 2008	500	27,036	Yes (closed Jan. 16, 2012)	CSP/tower	Hassayampa

TABLE B-2 (Cont.)

Serial Number	Customer Name (Project Name and/or Geographic Area)	Application Received	Capacity (MW)	BLM Acreage	Application Closed as of May 31, 2012?	Planned Technology[c]	Field Office
AZA 034799	LSR Palo Verde, LLC (LSR Palo Verde)	Aug. 27, 2008	600	5,855	Yes (closed Jan. 16, 2012)	CSP/trough	Lower Sonoran
AZA 034936	Wildcat Quartzsite, LLC (Quartzite)	Jan. 29, 2009	800	11,960	No	CSP/tower	Yuma
AZA 034946	Wildcat Harcuvar South, LLC (Bright Source Energy) (Wildcat Harcuvar SO)	Jan. 28, 2009	800	10,947	No	CSP/tower	Lake Havasu
AZA 035166	IDIT, Inc. (Arlington West)	July 27, 2009	Unknown	5,800	No	PV	Lower Sonoran
AZA 035236	Solar Reserve (Safford Solar Energy Center/ San Simon)	Jan. 4, 2010	250	22,892	No	PV	Safford
CACA 048669	First Solar (Stateline/Ivanpah)	Dec. 14, 2006	300	5,454	No	PV	Needles
CACA 048728	NextEra Energy (McCoy)	Jan. 31, 2007	750	7,754	No	PV	Palm Springs–South Coast
CACA 048808	Chuckwalla Solar 1, LLC (Chuckwalla)	Sept. 15, 2006	200	4,082	No	PV	Palm Springs–South Coast
CACA 048810	Solar Millennium/Chevron (Palen)	March 14, 2007	500	5,160	No	CSP/trough	Palm Springs–South Coast
CACA 048875	DPT Broadwell Lake, LLC (Broadwell SEGS)	Jan. 24, 2007	1,000	8,625	No	CSP/tower	Barstow
CACA 049002	Leopold Company, LLC (Ward Valley)	April 2, 2007	250	35,200	No	CSP/tower	Needles
CACA 049150	Sunpeak Solar, LLC (Superstition Solar I)	July 17, 2007	500	5,587	No	PV	El Centro

TABLE B-2 (Cont.)

Serial Number	Customer Name (Project Name and/or Geographic Area)	Application Received	Capacity (MW)	BLM Acreage	Application Closed as of May 31, 2012?	Planned Technology[c]	Field Office
CACA 049397	First Solar (Desert Quartzite)	Sept. 28, 2007	700	7,236	No	PV	Palm Springs–South Coast
CACA 049488	EnXco, Inc. (Mule Mountain)	Nov. 13, 2007	200	2,049	Yes (closed Dec. 13, 2011)	PV	Palm Springs–South Coast
CACA 049490	EnXco, Inc. (McCoy)	Nov. 13, 2007	300	20,480	No	CSP	Palm Springs–South Coast
CACA 049491	EnXco, Inc. (Desert Harvest)	Nov. 13, 2007	150	1,208	No	CSP	Palm Springs–South Coast
CACA 049584	Caithness Soda Mtn., LLC (Caithness Soda Mt.)	Dec. 14, 2007	350	7,995	No	CPV	Barstow
CACA 049585	Power Partners Southwest (ENXCO) (Troy Lake Soleil)	Dec. 12, 2007	200	3,834	No	PV	Barstow
CACA 49615	Pacific Solar Investments, Inc. (Iberdrola) (Ogilby Solar)	Sept. 4, 2007	450	7,405	No	CSP	El Centro
CACA 049884	Solar Reserve, LLC (Solar Reserve/Imperial County)	April 24, 2008	250	4,000	No	CSP/tower	El Centro
CACA 050390	**Solar Reserve (Mule Mountain III)**	**Aug. 13, 2008**	**250**	**8,160**	No	**CSP/tower**	**Palm Springs–South Coast**
CACA 051625	San Diego Gas & Electric Co. (Ocotillo Sol)	Dec. 17, 2009	14	115	No	PV	El Centro
CACA 051812	Element Power (Great Valley—Atwell)	April 9, 2010	150	1,509	No	PV	Bakersfield

TABLE B-2 (Cont.)

Serial Number	Customer Name (Project Name and/or Geographic Area)	Application Received	Capacity (MW)	BLM Acreage	Application Closed as of May 31, 2012?	Planned Technology[c]	Field Office
CACA 051967	**BrightSource Energy (Sonoran West SEGS)**	**May 12, 2009**	**1,000**	**12,269**	No	**CSP/tower**	**Palm Springs–South Coast**
CACA 052130	**Ridgeline Energy (Indio Solar Project)**	**May 19, 2010**	**30**	**640**	No	**PV**	**Palm Springs–South Coast**
CACA 052471	Ridgeline Energy (South Kern Solar)	Dec. 23, 2010	20	160	Yes (closed Oct. 25, 2011)	PV	Bakersfield
CACA 052473	Ridgeline Energy (Twisselman Solar)	Dec. 23, 2010	10	80	Yes (closed Oct. 25, 2011)	PV	Bakersfield
CACA 052796	Brightsource Energy (Johnson Valley SEGS)	May 23, 2011	800	1,560	No	CSP/tower	Barstow
CACA 053138	**BrightSource Energy (Rio Mesa Solar)**	**May 14, 2011**	**750**	**8,188**	No	**CSP/tower**	**Palm Springs–South Coast**
CACA 053143	**Dixieland Solar Farm, LLC (Dixieland Solar)**	**Oct. 7, 2011**	**20.9**	**246**	No	**PV**	**El Centro**
NMNM 119969	EnXco Development Corp. (Afton)	Feb. 6, 2008	600	3,000	No	CSP/trough	Las Cruces
NMNM 120310	Iberdrola Renewables (Lordsburg Mesa)	March 25, 2008	1,500	24,320	Yes (date unknown)	CSP/trough	Las Cruces
NMNM 121092	Solar Reserve, LLC (Lordsburg)	Aug. 11, 2008	100	5,296	No	CSP/Tower	Las Cruces

TABLE B-2 (Cont.)

Serial Number	Customer Name (Project Name and/or Geographic Area)	Application Received	Capacity (MW)	BLM Acreage	Application Closed as of May 31, 2012?	Planned Technology[c]	Field Office
NVN 083129	Cogentrix Solar Services, LLC (McCullough Pass)	Jan. 18, 2007	1,000	19,840	Yes (closed May 16, 2012)	CSP	Las Vegas
NVN 083914	BrightSource Energy Solar Partners (Morman Mesa)	July 25, 2007	500	10,000	No	CSP/tower	Las Vegas
NVN 084052	NV Power Co. (Dry Lake Valley)	Aug. 14, 2007	125	919	No	CSP/trough	Las Vegas
NVN 084232	First Solar (Desert Spring)	Oct. 22, 2007	400	5,500	No	PV	Las Vegas
NVN 084465	Pacific Solar Investments, Inc. (Iberdrola) (Amargosa North)	Dec. 7, 2007	150	7,500	No	PV	Las Vegas
NVN 084631	BrightSource Energy Solar Partners	Jan. 28, 2008	1,200	2,000	No	CSP/tower	Las Vegas
NVN 084654	Navy Fac. Eng. Cmnd., SW (Fallon NAS Solar)	Jan. 25, 2008	4	37	No	PV	Stillwater
NVN 084704	Areva Solar NV	March 11, 2008	140	7,040	Yes (closed Jan. 19, 2012)	CSP/CLFR	Pahrump
NVN 085201	Ewindfarm, Inc. (Johnnie Pahrump)	May 14, 2008	500	10,880	Yes (closed May 16, 2012)	PV	Pahrump
NVN 085801	Silver State South Solar Power, LLC	Aug. 25, 2008	350	1,400	No	PV	Las Vegas
NVN 086158	Power Partners Southwest, LLC (ENXCO)	Sept. 18, 2008	250	3,885	Yes (closed May 18, 2012)	CSP	Las Vegas
NVN 086159	Power Partners Southwest, LLC (ENXCO)	Sept. 19, 2008	250	1,751	No	CSP	Las Vegas

TABLE B-2 (Cont.)

Serial Number	Customer Name (Project Name and/or Geographic Area)	Application Received	Capacity (MW)	BLM Acreage	Application Closed as of May 31, 2012?	Planned Technology[c]	Field Office
NVN 086248	Ausra NV I, LLC (Highway 160)	Oct. 6, 2008	420	10,080	No	CSP/trough	Pahrump
NVN 086249	Ausra NV I, LLC (Spector Range)	Oct. 9, 2008	Unknown	4,480	No	CSP/trough	Pahrump
NVN 086350	Solar Reserve, LLC (Pahroc Solar)	Oct. 2, 2008	180	7,680	No	CSP/tower	Caliente
NVN 086571	Abengoa Solar, Inc. (Lathrop Wells Solar)	Dec. 12, 2008	500	5,336	No	CSP/trough	Pahrump
NVN 086782	Southwest Solar Land Company, LLC	Feb. 23, 2009	100	Unknown	No	CPV	Las Vegas
NVN 087366	Solar Millennium, LLC	Nov. 9, 2008	500	Unknown	No	CSP/trough	Las Vegas
NVN 087756	Solar Millennium, LLC	June 4, 2009	250	Unknown	No	CSP/trough	Las Vegas
NVN 088552	GA-SNC Solar, LLC	May 13, 2010	150	825	No	PV	Las Vegas
NVN 089224	Abengoa Solar, Inc.	Oct. 5, 2010	70	Unknown	No	CSP/Tower	Las Vegas
NVN 089530	Silver State Solar, LLC	Feb. 24, 2011	Unknown	5,651	No	PV	Las Vegas
NVN 089560	Gasna 39, LLC	Dec. 17, 2010	50	600	No	PV	Las Vegas
NVN 089566	Lone Valley, LLC	Feb. 11, 2011	20	233	Yes (closed Jan 13, 2012)	PV	Las Vegas
NVN 089655	Element Power	Sept. 9, 2010	100	2,560	No	PV	Las Vegas
NVN 089656	Element Power	Sept. 9, 2010	50	640	No	PV	Las Vegas
NVN 089657	Element Power	Sept. 9, 2010	100	640	No	PV	Las Vegas

TABLE B-2 (Cont.)

Serial Number	Customer Name (Project Name and/or Geographic Area)	Application Received	Capacity (MW)	BLM Acreage	Application Closed as of May 31, 2012?	Planned Technology[c]	Field Office
NVN 089658	Element Power	Sept. 9, 2010	100	640	No	PV	Las Vegas
NVN 089659	Element Power	Sept. 9, 2010	100	1,280	No	PV	Las Vegas
NVN 090360	**Hidden Hills Solar**	**Sept. 9, 2011**	**50**	**593**	**Yes (closed Jan. 20, 2012)**	**PV**	**Las Vegas**
NVN 090476	**BrightSource Energy**	**Jan. 21, 2011**	**750**	**16,617**	No	**CSP/tower**	**Las Vegas**
NVN 090788	**Boulevard Assoc. (Sandy Valley Solar)**	**Oct. 21, 2011**	**250**	**3,217**	No	**PV**	**Las Vegas**

[a] This table contains only first-in-line applications. Subsequent applications for the same lands are not shown to avoid double counting of acreage and megawatts. However, second-in-line and subsequent applications may be considered as pending if they otherwise meet the criteria for pending, and the first-in-line application is closed (denied or withdrawn).

[b] This table replaces Table A-1 of the Supplement to the Draft Solar PEIS. Applications that were not listed in that table (i.e., filed after August 15, 2011, or inadvertently left off the table of pending applications) are shown in bold.

[c] CLFR = compact linear Fresnel collector; CSP = concentrating solar power; CPV = concentrating photovoltaic; PV = photovoltaic.

TABLE B-3 Summary Table for Pending Applications[a]

State	Pending Applications	BLM Acreage	Capacity (MW[b])
Arizona	28	371,622	16,450
California	22	156,707	8,915
Colorado	0	0	0
New Mexico	2	8,296	700
Nevada	26	89,353	6,649
Utah	0	0	0
Total	78	625,978	32,714

[a] Summary excludes the 13 applications closed (denied or withdrawn) as of May 31, 2012, identified in Table B-2.

[b] Megawatts for three pending applications were not available; acreages for four pending applications were not available.

B.2 REFERENCES

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this Final Solar PEIS. It is likely that at the time of publication of this Final Solar PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this Final Solar PEIS.

BLM and DOE (Bureau of Land Management and U.S. Department of Energy), 2011, *Supplement to the Draft Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States*, DES 11-49, DOE/EIS-0403D-S, Oct.

APPENDIX C:

PROPOSED BLM LAND USE PLAN AMENDMENTS UNDER THE BLM ACTION ALTERNATIVES OF THE SOLAR ENERGY DEVELOPMENT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

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APPENDIX C:

PROPOSED BLM LAND USE PLAN AMENDMENTS UNDER THE BLM ACTION ALTERNATIVES OF THE SOLAR ENERGY DEVELOPMENT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

Analyses conducted for the Final *Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States* (Solar PEIS) will support the amendment of U.S. Department of the Interior (DOI) Bureau of Land Management (BLM) land use plans in the six-state study area. This appendix presents the proposed land use plan amendments for the Final Solar PEIS (and replaces Appendix C of the Draft Solar PEIS and Appendix E of the Supplement to the Draft Solar PEIS).

Under BLM's action alternatives presented in Section 2.2 of this Final Solar PEIS, the BLM anticipates making the following land use plan decisions that will establish the foundation for a comprehensive Solar Energy Program:

1. Land use plan amendments that identify exclusion areas for utility-scale solar energy development in the six-state study area;

2. Land use plan amendments that identify priority areas for solar energy development that are best suited for utility-scale production of solar energy (i.e., solar energy zones [SEZs]);

3. Land use plan amendments that identify variance areas for utility-scale solar energy development in the six-state study area; and

4. Land use plan amendments that establish programmatic design features (i.e., mitigation requirements) for solar energy development on public lands to ensure the most environmentally responsible development and delivery of solar energy. Additional design features have been proposed for individual SEZs (SEZ-specific design features).

Table C-1 lists all of the land use plans in the six-state study area to be amended. Table C-1 also includes the acres proposed to be available for utility-scale energy development in SEZs and variance areas by individual planning area.

As discussed in the Draft Solar PEIS and the Supplement to the Draft, land use plans that are undergoing revision or amendment concurrent with the Solar PEIS will be reviewed to identify and resolve inconsistencies between the Solar PEIS and individual planning efforts.

TABLE C-1 Proposed Land Use Plans To Be Amended and Proposed Acreage Available for Application for Solar Energy Development by Planning Area[a]

Plan/BLM Office	Approximate Proposed Acreage in Variance Areas[b]	Proposed Developable Acreage in SEZs
Arizona[c]		
Agua Fria NM Plan, Hassayampa Field Office	All lands would be excluded.	None
Arizona Strip RMP, Arizona Strip Field Office	739,340 acres	None
Bradshaw–Harquahala RMP, Hassayampa Field Office	185,323 acres	None
Grand Canyon–Parashant NM Plan, Arizona Strip Field Office	All lands would be excluded.	None
Gila Box Riparian NCA Plan, Safford Field Office	11 acres	None
Goldwater Range RMP, Lower Sonoran Field Office	71 acres	None
Kingman R.A. RMP, Kingman Field Office	662,508 acres	None
Lake Havasu RMP, Lake Havasu Field Office	506,107 acres	Brenda SEZ (3,348 acres)
Las Cienegas NCA Plan, Tucson Field Office	All lands would be excluded.	None
Lower Gila North and South RMP Amendment, Lower Sonoran Field Office	295,867 acres	Gillespie SEZ (2,618 acres)
Phoenix R.A. RMP, Lower Sonoran, Safford, and Tucson Field Offices	238,880 acres	None
Safford RMP, Safford, and Tucson Field Offices	608,611 acres	None
San Pedro Riparian NCA Plan, Tucson Field Office	143 acres	None

TABLE C-1 (Cont.)

Plan/BLM Office	Approximate Proposed Acreage in Variance Areas[b]	Proposed Developable Acreage in SEZs
Arizona (Cont.)		
Vermilion Cliffs NM Plan, Arizona Strip Field Office	All lands would be excluded.	None
Yuma RMP, Yuma Field Office	144,015 acres	None
Total for Arizona	3,380,877 acres	5,966 acres
California[c]		
Alturas RMP, Alturas Field Office	All lands would be excluded.	None
Arcata RMP, Arcata Field Office	All lands would be excluded.	None
Bishop RMP, Bishop Field Office	31,581 acres	None
Caliente RMP, Bakersfield Field Office	1,496 acres	None
California Coastal NM Plan, California State Office	All lands would be excluded.	None
California Desert Conservation Area RMP, Barstow, El Centro, Needles, Palm Springs–South Coast, and Ridgecrest Field Offices[d]	730,616 acres	Imperial East SEZ (5,717 acres) Riverside East SEZ (147,910 acres)
Carrizo Plain NM Plan, Bakersfield Field Office	All lands would be excluded.	None
Eagle Lake RMP, Eagle Lake Field Office	11 acres	None
Eastern San Diego RMP, El Centro Field Office	228 acres	None
Headwaters Forest Reserve Plan, Arcata Field Office	All lands would be excluded.	None
Hollister RMP, Hollister Field Office	All lands would be excluded.	None

TABLE C-1 (Cont.)

Plan/BLM Office	Approximate Proposed Acreage in Variance Areas[b]	Proposed Developable Acreage in SEZs
California (Cont.)		
King Range NCA Plan, Arcata Field Office	All lands would be excluded.	None
Piedras Blancas Historic Light Station ONA Plan, Bakersfield Field Office	All lands would be excluded.	None
Redding RMP, Redding Field Office	All lands would be excluded.	None
Santa Rosa and San Jacinto Mountains NM Plan, Palm Springs–South Coast Field Office	All lands would be excluded.	None
Sierra RMP, Folsom Field Office	1 acre	None
South Coast RMP, Palm Springs–South Coast Field Office	2,145 acres	None
Surprise RMP, Surprise Field Office	All lands would be excluded.	None
Ukiah RMP, Ukiah Field Office	All lands would be excluded.	None
Total for California	766,078 acres	153,627 acres
Colorado[c]		
Canyon of the Ancients NM Plan, Canyon of the Ancients NM	All lands would be excluded.	None
Glenwood Springs RMP, Glenwood Springs Field Office	All lands would be excluded.	None
Grand Junction RMP, Grand Junction Field Office	All lands would be excluded.	None
Gunnison RMP, Gunnison Field Office	3,162 acres	None
Gunnison Gorge NCA Plan, Gunnison Field Office	All lands would be excluded.	None

TABLE C-1 (Cont.)

Plan/BLM Office	Approximate Proposed Acreage in Variance Areas[b]	Proposed Developable Acreage in SEZs
Colorado (Cont.)		
Kremmling RMP, Kremmling Field Office	All lands would be excluded.	None
Little Snake RMP, Little Snake Field Office	All lands would be excluded.	None
McInnis Canyons NCA Plan, Grand Junction Field Office	All lands would be excluded.	None
Royal Gorge/Northeast RMP, Royal Gorge Field Office	29,477 acres	None
San Juan Public Lands Center RMP, Columbine, Dolores, Pagosa Springs, and Uncompahgre Field Offices	12,105 acres	None
San Luis Valley	7 acres	None
San Luis Valley Public Lands Center RMP, Del Norte, La Jara, and Saguache Field Offices	50,377 acres	Antonito Southeast SEZ (9,712 acres) La Jara Field Office De Tilla Gulch SEZ (1,064 acres) Saguache Field Office Fourmile East SEZ (2,882 acres) La Jara Field Office Los Mogotes East SEZ (2,650 acres) La Jara Field Office
Uncompahgre RMP, Uncompahgre Field Office	All lands would be excluded.	None
White River RMP, White River Field Office	All lands would be excluded.	None
Total for Colorado	95,128 acres	16,308 acres

TABLE C-1 (Cont.)

Plan/BLM Office	Approximate Proposed Acreage in Variance Areas[b]	Proposed Developable Acreage in SEZs
Nevada[c]		
Black Rock Desert—High Rock Canyon Emigrant Trails NCA Plan Winnemucca District Office	All lands would be excluded.	None
Carson City Consolidated RMP, Carson City District	918,161 acres	None
U.S. Department of Energy Plan, Southern Nevada District Office[e]	All lands would be excluded.	None
Elko RMP, Elko District Office	All lands would be excluded.	None
Ely RMP, Ely District Office	3,344,963 acres	Dry Lake Valley North SEZ (25,069 acres)
Las Vegas RMP, Southern Nevada District Office	873,518 acres	Amargosa Valley SEZ 8,479 acres) Dry Lake SEZ (5,717 acres)
Nellis Non-renewal Area Plan, Southern Nevada District Office[e]	All lands would be excluded.	None
Nellis Test & Training Range RMP, Southern Nevada District Office[e]	All lands would be excluded.	None
Paradise–Denio RMP, Winnemucca District Office	All lands would be excluded.	None
Red Rock Canyon NCA Plan, Southern Nevada District Office	182 acres	None
Shoshone–Eureka RMP, Battle Mountain District Office	663,198 acres	None
Sloan Canyon NCA Plan, Southern Nevada District Office	17 acres	None

TABLE C-1 (Cont.)

Plan/BLM Office	Approximate Proposed Acreage in Variance Areas[b]	Proposed Developable Acreage in SEZs
Nevada (Cont.)		
Sonoma–Gerlach RMP, Winnemucca District Office	85,771 acres	None
Tonopah RMP, Battle Mountain District Office	3,190,335 acres	Gold Point SEZ (4,596 acres)
		Millers SEZ (16,534 acres)
Wells RMP, Elko District Office	All lands would be excluded.	None
Total for Nevada	9,076,145 acres	60,395 acres
New Mexico[c]		
Carlsbad RMP, Carlsbad Field Office	271,504 acres	None
El Malpais NCA Plan, Rio Puerco Field Office	64 acres	None
Farmington RMP, Farmington Field Office	391,095 acres	None
Kasha–Katuwe Tent Rocks NM Plan, Rio Puerco Field Office	All lands would be excluded.	None
McGregor Range RMP, Las Cruces District Office	All lands would be excluded.	None
Mimbres RMP, Las Cruces District Office	1,416,196 acres	Afton SEZ (29,964 acres)
Rio Grande Corridor	34 acres	None
Rio Puerco RMP, Rio Puerco Field Office	320,387 acres	None
Roswell RMP, Roswell Field Office	759,743 acres	None
Socorro RMP, Socorro Field Office	656,335 acres	None

TABLE C-1 (Cont.)

Plan/BLM Office	Approximate Proposed Acreage in Variance Areas[b]	Proposed Developable Acreage in SEZs
New Mexico (Cont.)		
Taos RMP, Taos Field Office	24,191 acres	None
White Sands RMP, Las Cruces District Office	344,972 acres	None
Total for New Mexico	4,184,520 acres	29,964 acres
Utah[c]		
Box Elder RMP, Salt Lake City Field Office[f]	All lands would be excluded.	None
Cedar–Beaver–Garfield–Antimony RMP, Cedar City Field Office	177,089 acres	Escalante Valley SEZ (6,533 acres) Milford Flats South SEZ (6,252 acres)
Grand Staircase–Escalante NM Plan, Grand Staircase–Escalante NM	8 acres	None
House Range RMP, Fillmore Field Office[f]	213,111 acres (all inside the UTTR)	None
Kanab RMP, Kanab Field Office	18,633 acres	None
Moab RMP, Moab Field Office	587 acres	None
Monticello RMP, Monticello Field Office	4,129 acres	None
Park City MFP, Salt Lake City Field Office	All lands would be excluded.	None
Pinyon MFP, Cedar City Field Office[f]	474,727 acres (468,540 acres outside the UTTR) (7,125 acres inside the UTTR)	Wah Wah Valley SEZ (5,873 acres)

TABLE C-1 (Cont.)

Plan/BLM Office	Approximate Proposed Acreage in Variance Areas[b]	Proposed Developable Acreage in SEZs
Utah (Cont.)		
Pony Express RMP, Salt Lake City Field Office[f]	All lands would be excluded.	None
Price RMP, Price Field Office	26 acres	None
Randolf MFP, Salt Lake City Field Office	All lands would be excluded.	None
Richfield RMP, Richfield Field Office	107,071acres	None
St. George RMP, St. George Field Office	9,402 acres	None
Vernal RMP, Vernal Field Office	All lands would be excluded.	None
Warm Springs RMP, Fillmore Field Office[f]	804,974 acres (200,371 acres outside the UTTR) (604,603 acres inside the UTTR)	None
Total for Utah	1,809,759 acres	18,658 acres

Abbreviations: MFP = Management Framework Plan; NCA = National Conservation Area; NM = National Monument; ONA = Outstanding Natural Area; RMP = Resource Management Plan; SEZ = solar energy zone; UTTR = Utah Test and Training Range.

[a] This table replaces Table C-1 of the Draft Solar PEIS (BLM and DOE 2010) and Table E-1 of the Supplement to the Draft Solar PEIS (BLM and DOE 2011). Land use plan amendments for the program alternative would include the identification of SEZs and the identification of variance areas; all remaining lands in a planning area would be identified as exclusion areas. Land use plan amendments for the SEZ alternative would include the identification of SEZs; all remaining lands in a planning area would be identified as exclusion areas. Totals may be off due to rounding. This table lists plans as of August 2010.

[b] These acreage estimates include the acreage in the proposed SEZs. The estimates were calculated on the basis of the best available geographic information system (GIS) data. GIS data were not available for the entire set of exclusions listed in Table 2.2-2 of this Final Solar PEIS; thus the exact acreage could not be calculated. Exclusion areas that could not be mapped because of the lack of data would be identified during the ROW application process.

Footnotes continued on next page.

TABLE C-1 (Cont.)

[c] For state totals, refer to Table 2.2-1 of this Final Solar PEIS.

[d] The California Desert Conservation Area (CDCA) RMP, in addition to requiring that sites not previously associated with power generation or transmission be considered through a plan amendment process, also describes four multiple use classes (Class C, Class L, Class M, and Class I). Under the current CDCA RMP, solar energy projects can be sited on Class L, M, and I lands, provided that NEPA requirements are met. The CDCA RMP also requires a plan amendment for individual energy projects; the amendment to this plan pursuant to the Solar PEIS Record of Decision (ROD) would remove this requirement for individual plan amendments for utility-scale solar energy projects within SEZs. The requirement would remain for projects proposed in variance areas.

[e] Public lands in these planning areas in Nevada have been temporarily withdrawn for use by another federal agency.

[f] Section 2815(d) of the National Defense Authorization Act (NDAA) for fiscal year 2000 (P.L. 106-65) placed a moratorium on planning efforts on BLM-administered lands "adjacent to, or near the Utah Test and Training Range (UTTR) and Dugway Proving Grounds or beneath Military Operating Areas, Restricted Areas, and airspace that make up the UTTR," NDAA § 2815(a), 113 Stat. 512, 852 (1999). This area encompasses a portion of the lands within the boundaries of the Box Elder, Pony Express, House Range, Warm Springs, and Pinyon land use plans. Within these areas, decisions related to whether lands would be available for ROW application, and adoption of the policies and design features of the PEIS, cannot be implemented via land use plan amendments at this time. Solar energy development ROW applications would be deferred until such time as plan amendments or new land use plan(s) address solar energy development. No SEZs are located within the UTTR affected areas.

REFERENCES FOR APPENDIX C

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this Final Solar PEIS. It is likely that at the time of publication of this Final Solar PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this Final Solar PEIS.

BLM and DOE (Bureau of Land Management and U.S. Department of Energy), 2010, *Draft Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States*, DES 10-59, DOE/EIS-0403, Dec.

BLM and DOE, 2011, *Supplement to the Draft Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States*, DES 11-49, DOE/EIS-0403D-S, Oct.

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APPENDIX D:

UPDATE TO SUMMARY OF REGIONAL INITIATIVES AND STATE PLANS FOR SOLAR ENERGY DEVELOPMENT AND TRANSMISSION DEVELOPMENT TO SUPPORT RENEWABLE ENERGY DEVELOPMENT

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APPENDIX D:

UPDATE TO SUMMARY OF REGIONAL INITIATIVES AND STATE PLANS FOR SOLAR ENERGY DEVELOPMENT AND TRANSMISSION DEVELOPMENT TO SUPPORT RENEWABLE ENERGY DEVELOPMENT

Appendix D of the Draft *Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States* (Solar PEIS) presented information about a number of regional and state initiatives that have been undertaken in the six-state study area to facilitate development of renewable energy resources and necessary expansion of the electricity transmission system. This included information about the Western Governors' Association (WGA) efforts to identify optimal areas for renewable energy development and transmission expansion, state-level Renewable Portfolio Standards (RPSs), other state-level initiatives, and a U.S. Department of Defense (DoD) effort assessing solar energy development potential at DoD installations in southern California and Nevada. Appendix D included maps depicting how most of these efforts relate to the solar-energy-related designations being proposed by the U.S. Department of the Interior (DOI) Bureau of Land Management (BLM) in the Draft Solar PEIS, including lands proposed by the BLM as being available for solar energy development (BLM Lands Available) and as solar energy zones (SEZs).

The information presented in this update to Appendix D for the Final Solar PEIS supplements, but does not replace, the information provided in the corresponding Appendix D in the Draft Solar PEIS. The BLM and the U.S. Department of Energy (DOE) have been coordinating with other organizations on many of these efforts and are committed to continuing to do so into the future. Many of these initiatives have continued since publication of the Draft Solar PEIS; sources of current information about these initiatives are presented in Table D-1. In addition, an updated summary of the state RPSs is provided in Table 1.6-1 of the Final Solar PEIS.

TABLE D-1 Update to Summary Information about Regional and Initiatives and State Plans for Solar Energy Development and Transmission Development to Support Renewable Energy Development[a]

Initiative	Current Web Site	Relevant Publications
Western Governors' Association Western Renewable Energy Zone Initiative and Regional Transmission Expansion Planning	http://www.westgov.org/rtep	WGA and DOE (2009), WGA (2010, 2012), Keyes & Fox, LLP, and Aspen Environmental (2012)
State Renewable Portfolio Standards[b]	http://www.dsireusa.org	North Carolina Solar Center and Interstate Renewable Energy Council (2012)
Arizona Renewable Resource and Transmission Identification Subcommittee (AARTIS)	NA[c]	AARTIS (2009)
California Renewable Energy Transmission Initiative (RETI)	http://www.energy.ca.gov/reti	RETI (2008, 2009a,b, 2010)
California Renewable Energy Action Team (REAT), Desert Renewable Energy Conservation Plan (DRECP), and Interim Mitigation Strategy	http://www.energy.ca.gov/33by2020 and http://www.drecp.org	California Department of Game and Fish (2010), DRECP Independent Science Advisors (2010), REAT (2010)
Colorado Renewable Energy Development Infrastructure	http://www.colorado.gov/cs/Satellite/GovEnergyOffice/CBON/1251597774726	Colorado Governor's Energy Office (2007, 2009, 2010)
Nevada Renewable Energy Transmission Access Advisory Committee, Nevada Energy Assistance Corporation (NEAC) Transmission Initiative Routing Study, and Nevada New Energy Task Force	http://energy.nv.gov	State of Nevada (2007, 2009), NEAC (2012)
New Mexico Renewable Energy Transmission Authority (RETA)	http://nmreta.com	RETA (2011)
Utah Renewable Energy Zone Selection Working Group	http://www.energy.utah.gov/renewable_energy/urez/task_force.htm	Berry et al. (2009), State of Utah (2010)
Solar Energy Potential at DoD Installations in the Colorado and Mojave Deserts	NA	Kwartin et al. (2012)

[a] Information current as of June 2012.

[b] See Table 1.6-1 of the Final Solar PEIS for information about RPSs in the six-state study area.

[c] NA = not applicable.

REFERENCES FOR UPDATED APPENDIX D

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

AARTIS (Arizona Renewable Resource and Transmission Identification Subcommittee), 2009, *Final Report of the Arizona Renewable Resource and Transmission Identification Subcommittee*, submitted to the Renewable Transmission Task Force of the Southwest Area Transmission Planning Group, Sept. Available at http://www.westconnect.com/filestorage/ARRTIS%20Final%20Report.pdf.

Berry, J., et al., 2009, *Utah Renewable Energy Zones Task Force Phase I Report: Renewable Energy Zone Resource Identification*, Utah Geological Survey Miscellaneous Publication 09-1, prepared for Utah Renewable Energy Zone Task Force. Available at http://www.energy.utah.gov/renewable_energy/urez/urez_taskforce_I.htm.

California Department of Game and Fish, 2010, *Interim Mitigation Strategy As Required by SM X8 34*, Sept. Available at http://www.drecp.org/documents/#drecp.

Colorado Governor's Energy Office, 2007, *Connecting Colorado's Renewable Resources to the Markets*, Colorado Senate Bill 07-091, Renewable Resource Generation Development Areas Task Force, Dec. Available at http://www.colorado.gov/cs/Satellite/GovEnergyOffice/CBON/1251597774824.

Colorado Governor's Energy Office, 2009, *Renewable Energy Development Infrastructure: Connecting Colorado's Renewable Resources to the Markets in a Carbon-Constrained Electricity Sector*, Dec. Available at http://www.colorado.gov/cs/Satellite/GovEnergyOffice/CBON/1251597774824.

Colorado Governor's Energy Office, 2010, *STAR Strategic Transmission and Renewables, A Vision of Colorado's Electric Power Sector to the Year 2050*, Dec. Available at http://www.colorado.gov/cs/Satellite/GovEnergyOffice/CBON/1251597774824.

DRECP Independent Science Advisors (Desert Renewable Energy Conservation Plan Independent Science Advisors), 2010, *Public Review Draft Recommendations of Independent Science Advisors for The California Desert Renewable Energy Conservation Plan (DRECP)*, prepared for the Renewable Energy Action Team, Oct. Available at http://www.drecp.org.

Keyes & Fox, LLP, and Aspen Environmental Group, 2012, *Recommendations to Western Governors' Association Transmission Siting Process Reforms*, prepared for Western Governors' Association, April. Available at http://www.westgov.org/rtep.

Kwartin, R., et al., 2012, *Solar Energy Development on Department of Defense Installations in the Mojave and Colorado Deserts*, Jan. Available at http://www.serdp-estcp.org/News-and-Events/News-Announcements/Program-News/DoD-study-finds-7-000-megawatts-of-solar-energy-potential-on-DoD-installations-in-Mojave-Desert.

NEAC (Nevada Energy Assistance Corporation), 2012, *Transmission Initiative Routing Study*, prepared by TriSage Consulting, Energy Source, and U.S. Geomatics, Feb. Available at http://energy.nv.gov/resources-forms/neac.html.

North Carolina Solar Center and Interstate Renewable Energy Council, 2012, *Database of State Incentives for Renewables & Efficiency*. Available at http://www.dsireusa.org.

REAT (Renewable Energy Action Team), 2010 *Best Management Practices and Guidance Manual, Desert Renewable Energy Projects*, Dec. Available at http://www.drecp.org/documents/#drecp.

RETA (Renewable Energy Transmission Authority), 2011, *New Mexico Senate Memorial 44 (SM 44)*, Version 2.0 Report, May. Available at http://nmreta.com/index.php?option=com_content&view=article&id=49&Itemid=60.

RETI (Renewable Energy Transmission Initiative), 2008, *Renewable Energy Transmission Initiative Phase 1A Final Report*, prepared for the RETI Coordinating Committee and RETI Stakeholder Steering Committee, April. Available at http://www.energy.ca.gov/reti/index.html.

RETI, 2009a, *Renewable Energy Transmission Initiative Phase 1B Final Report*, prepared for the RETI Coordinating Committee and RETI Stakeholder Steering Committee, Jan. Available at http://www.energy.ca.gov/reti/index.html.

RETI, 2009b, *Renewable Energy Transmission Initiative Phase 2A Final Report*, prepared for the RETI Coordinating Committee and RETI Stakeholder Steering Committee, Sept. Available at http://www.energy.ca.gov/reti/index.html.

RETI, 2010, *Renewable Energy Transmission Initiative Phase 2B Final Report*, prepared for the RETI Coordinating Committee and RETI Stakeholder Steering Committee, May. Available at http://www.energy.ca.gov/reti/index.html.

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WGA (Western Governors' Association), 2010, *Regional Transmission Expansion Project Briefing Paper*, Sept. Available at http://www.westgov.org/rtep.

WGA, 2012, *Renewable Resources and Transmission in the West: Interviews on the Western Renewable Energy Zones Initiative*, March. Available at http://www.westgov.org/rtep.

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APPENDIX E:

UPDATE TO METHODS FOR ESTIMATING REASONABLY FORESEEABLE DEVELOPMENT SCENARIOS FOR SOLAR ENERGY DEVELOPMENT

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APPENDIX E:

UPDATE TO METHODS FOR ESTIMATING REASONABLY FORESEEABLE DEVELOPMENT SCENARIOS FOR SOLAR ENERGY DEVELOPMENT

Appendix E of the Draft *Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States* (Solar PEIS) presented the methodology for calculating a reasonably foreseeable development scenario (RFDS) for solar energy development in the six-state study area through 2030. The information presented in this update to Appendix E for the Final Solar PEIS summarizes, but does not replace, the information provided in the corresponding Appendix E in the Draft Solar PEIS. The RFDS that was developed for the Draft Solar PEIS is considered to be valid to support analyses in this Final Solar PEIS and has not been modified. The RFDS results used in the Solar PEIS analyses are presented in Table 2.4-1 in the Final Solar PEIS.

The RFDS estimates the amount of solar energy development that might occur in each state and is presented in terms of projected megawatts and estimated acres of land required to support that level of development. It is used to support the assessment of potential impacts of solar energy development on the quality of the human and ecological environment, including the assessment of cumulative impacts.

Appendix E of the Draft Solar PEIS presented two methodologies for estimating the RFDS. One methodology used the Regional Energy Deployment System (ReEDS) model, developed by the National Renewable Energy Laboratory (NREL). The other methodology used each state's Renewable Portfolio Standard (RPS) to estimate corresponding renewable energy and solar energy development required to meet those standards. The results of the RPS-based methodology were used to estimate the RFDS for the Solar PEIS because that methodology projected the greatest level of development and, therefore, established a likely upper bound on potential environmental impacts. The state RPS standards, which are summarized in Table 1.6-1 of the Final Solar PEIS, have not changed since the RFDS was calculated for the Draft Solar PEIS.

The RPS-based methodology, which is described in detail in Appendix E of the Draft Solar PEIS, included:

1. Identifying the percentages of total future electricity sales to be supplied by renewable energy sources (i.e., the RPS requirements) for each state;

2. Identifying current capacities, generation, and electricity sales statistics for each state;

3. Applying regional projected growth rates to determine anticipated total electricity sales for each state in the designated RPS years;

4. Applying RPS requirements to determine anticipated renewable energy development;

5. Making adjustments for contributions to the RPS requirements, as allowed, for existing conventional hydroelectric sources or other qualifying technologies;

6. Postulating several fractional "market shares" for solar as percentages of total renewable generation/sales needed to satisfy the RPS requirements in each state;

7. Deriving the amounts of energy associated with each of the postulated fractions that might be anticipated from solar contributions; and

8. Deriving the associated capacities for solar power based on the results from Step 7 and estimated capacity factors.

To establish an upper bound, it was assumed that 50% of the RPS-based requirement for renewable energy production would be provided from solar energy and that 75% of the solar development would occur on BLM-administered lands within the specific state. The calculated number of BLM and non-BLM-administered acres likely to be developed over the next 20 years was based on the assumed RFDS and on a high-end estimated land requirement of 9 acres/MW (0.04 km^2/MW) for development.

APPENDIX F:

UPDATE TO SOLAR ENERGY TECHNOLOGY OVERVIEW

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APPENDIX F:

UPDATE TO SOLAR ENERGY TECHNOLOGY OVERVIEW

Appendix F of the Draft *Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States* (Solar PEIS) presented detailed information about solar energy technologies (concentrating solar power [CSP] and photovoltaic [PV]) and transmission facilities and grid interconnections. Relevant information from Appendix F was summarized and referenced in Chapter 3 of the Draft Solar PEIS.

In this update to Appendix F for the Final Solar PEIS, the information that was provided in Appendix F of the Draft Solar PEIS is being summarized; no additional information on solar technologies is being provided. Developers of solar energy facilities will provide current technical and environmental information on relevant technologies in preparation for development of individual projects on public lands.

Appendix F of the Draft Solar PEIS described the five technology categories addressed in the Solar PEIS, including three concentrating solar power CSP technologies (i.e., parabolic trough [including a compact linear Fresnel reflector], solar power tower, and solar dish engine) and two PV technologies (i.e., flat-plate PV and concentrating PV). For each technology, Appendix F of the Draft Solar PEIS presented information about:

- How each technology produces electricity and the major components that a facility would need to produce electricity at the utility scale;
- The current state of commercial solar technologies; and
- The environmental footprint of a utility-scale facility, identifying key resource demands.

In addition, Appendix F of the Draft Solar PEIS presented information about transmission lines and grid interconnections.

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APPENDIX G:

UPDATE TO TRANSMISSION CONSTRAINT ANALYSIS

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APPENDIX G:

UPDATE TO TRANSMISSION CONSTRAINT ANALYSIS

Appendix G of the Draft *Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States* (Solar PEIS) presented information about potential impediments to new solar energy development in the six-state study area presented by transmission constraints. Section G.1 of the Draft Solar PEIS described and provided maps of the transmission system, congestion of the transmission system, planned new lines, and designated transmission corridors as of December 2010. Section G.2 of the Draft Solar PEIS presented maps showing lands within each of the six states that were considered to be constrained by lack of transmission access, that is, located greater than 25 mi (40 km) from existing transmission lines or designated corridors. Section G.2 also characterized the extent to which BLM-administered lands that were proposed in the Draft Solar PEIS to be available for solar energy development right-of-way (ROW) application (i.e., proposed program alternative lands, including Solar Energy Zones [SEZs]) were constrained by lack of transmission access. On the basis of the analyses presented in Section G.2 of the Draft Solar PEIS, the U.S. Department of the Interior (DOI) Bureau of Land Management (BLM) determined that it would not analyze the designation of new transmission corridors as part of the Solar PEIS.

The information presented in this updated Appendix G for the Final Solar PEIS supplements, but does not replace, the information provided in the corresponding Appendix G in the Draft Solar PEIS. As discussed in Section G.4 of this updated appendix, the BLM and the U.S. Department of Energy (DOE) decided to prepare additional analyses of transmission constraints for the 17 SEZs proposed in the Final Solar PEIS based on comments on the Draft Solar PEIS. Section G.4 of this updated appendix describes the methodology used in this additional analysis; the results of the analysis for each proposed SEZ are presented in Chapters 8 through 13 of the Final Solar PEIS.

G.1 TRANSMISSION ACCESS CONSIDERATIONS

Information provided in the Draft Solar PEIS remains valid; there are no updates for this section.

G.2 TRANSMISSION CONSTRAINT ANALYSIS FOR BLM-ADMINISTERED LANDS

Information provided in the Draft Solar PEIS remains valid; there are no updates for this section.

G.3 REFERENCES FOR APPENDIX G OF THE DRAFT SOLAR PEIS

Information provided in the Draft Solar PEIS remains valid; there are no updates for this section.

G.4 ADDITIONAL TRANSMISSION ANALYSIS FOR THE FINAL SOLAR PEIS

G.4.1 Background for Additional Transmission Analysis

The Draft Solar PEIS included: (1) generic analysis of the environmental impacts of construction and operation of transmission lines and substations (Section 5 of the Draft Solar PEIS); (2) proposed design features to reduce or eliminate impacts (Appendix A of the Draft Solar PEIS); (3) transmission constraints analysis to determine whether additional corridor designation on BLM-administered lands would be needed to facilitate solar development (Appendix G, Section G.2 of the Draft Solar PEIS); and (4) analysis of the environmental impacts of constructing transmission from the individual proposed SEZs to the nearest existing transmission line based on the assumption that existing lines could be upgraded (contained in individual SEZ sections in Chapters 8 through 13 of the Draft Solar PEIS).

Commentors, including the U.S. Environmental Protection Agency (EPA), disagreed with the simplifying assumptions used to analyze environmental impacts of connecting transmission to SEZs and stated that impacts from transmission could be substantially greater than those portrayed in the Draft Solar PEIS. Comments from industry and environmental organizations noted that BLM policies should address cooperative development, sharing of generation tie-lines, and transmission incentives that could facilitate development within SEZs, and that they should be integrated with ongoing regional and state-level transmission planning efforts. Some commentors also asked for a much more comprehensive transmission analysis that would include available capacity, costs associated with building or upgrading infrastructure, and timing of new transmission.

The SEZ-specific transmission analysis presented in the Draft Solar PEIS represented an assessment of the minimum, or lower-bound, transmission-related impacts for each SEZ. As stated in the Supplement to the Draft Solar PEIS, the agencies have conducted additional transmission analysis for each of the proposed SEZs to quantify an upper bound of potential impacts of transmission access at each SEZ. It is expected that actual environmental impacts of connecting transmission to SEZs will fall somewhere between the lower and upper bounds described for each SEZ. New transmission lines and/or upgrades will require site-specific National Environmental Policy Act (NEPA) analysis prior to construction.

The overall scope and approach for the additional transmission analysis was guided by an extensive review of comments on the Draft Solar PEIS and the Supplement to the Draft Solar PEIS, and by input from staff at the BLM, DOE, National Renewable Energy Laboratory (NREL), Western Area Power Administration (Western), and Western Electricity Coordinating Council (WECC). The group of reviewers agreed that establishing a reasonable upper-bound estimate for transmission requirements and impacts (referred to as the Dedicated Line Transmission [DLT] analysis) would provide the analysis of potential environmental impacts to fulfill the requirements of NEPA for the programmatic scope of the Solar PEIS. The methods for the upper-bound impact analysis are described in this Section, and the SEZ-specific results are presented in Chapters 8 through 13 of this Final Solar PEIS.

As presented in the Supplement, the agencies also considered and tested a mid-range analysis, referred to as the Shared Line Transmission (SLT) analysis, in an attempt to evaluate the available capacity of the existing grid and available information about new planned or proposed transmission lines, some of which may be able to accommodate new solar electricity generation. The SLT methodology was determined to be useful in estimating potential spare capacity on existing lines, but is subject to greater uncertainties than estimating upper bounds as developed through the DLT analysis. While the SLT approach provides reasonable treatments of many transmission system capability factors, it does not capture all of the considerations that influence transmission planning. For example, some of the technical representations that are typically addressed with greater precision in full-scale load flow studies were beyond the scope of this study (such as simulating all generation sources, all loads, and all transmission elements dynamically to determine how new generation sources influence system-wide balances). Based on these considerations, feedback on the methodology, and comments on an initial SLT test case, the SEZ-specific results of the SLT analyses have not been included in Chapters 8 through 13 of this Final Solar PEIS.

In support of more detailed system-level analyses of transmission needs and development, the agencies are involved in a number of concurrent activities. The DOE directly supports an Interconnection-Wide Transmission Planning Initiative for the Western Interconnection, within which the proposed SEZs (and any future identified SEZs) have a role as potential future generation site locations. The agencies are committed to ensuring that SEZs are included in transmission planning efforts in both the WECC and the California Independent System Operator (CAISO), to the extent practicable. For example, the lead agencies have submitted a study request of the proposed SEZs to the WECC's Transmission Expansion Planning Policy Committee (TEPPC) proposing that the SEZs be reviewed as a case study as part of the TEPPC 2012 Study Program.[1] The Draft 2012 Study Program shows that study of the request has been prioritized as high, meaning that the SEZs will be studied in the first round of the TEPPC study. The agencies will also engage in other comprehensive transmission planning efforts in California and the region, including the regional planning and cost-allocation processes required by Federal Energy Regulatory Commission (FERC) Order 1000 as appropriate, to ensure the recognition of SEZs as a priority in future transmission development. The next steps in this coordinated transmission strategy process are discussed in Section G.4.4.

In addition, transmission considerations will be an early and integral component of the BLM SEZ identification protocol (Section A.2.6 of Appendix A), focusing on near-term transmission projects and coordination with ongoing transmission planning efforts through other organizations. Examples of such efforts include those being carried out by TEPPC, regional and subregional planning groups, the Western Governors' Association State/Provincial Steering Committee, utility-level planning initiatives, and investigations by many other stakeholders.

[1] The TEPPC analysis process is an existing, formal, biennial process used by WECC to assess system impacts across the interconnection when adding resources and/or transmission. It analyzes system congestion and system performance under reliable system operating criteria. The BLM will submit similar study requests for all new SEZs.

The scope of the SEZ-specific transmission analyses conducted for the Solar PEIS to support environmental impacts analysis consistent with the requirements of NEPA includes:

1. A *lower-bound analysis* that assumes a minimal amount of new transmission infrastructure development; that is, the existing transmission grid can be upgraded to accommodate new solar electricity generation (presented in the Draft Solar PEIS in the individual SEZ sections [Chapters 8 through 13]); and

2. An *upper-bound DLT analysis* that assumes new solar electricity generation will require all-new transmission infrastructure; that is, the existing transmission grid cannot accommodate any new solar electricity generation) (presented in the Final Solar PEIS in the individual SEZ sections [Chapters 8 through 13]).

Section G.4.2 of this appendix discusses the factors that can limit accurate prediction of transmission needs for the SEZs. Section G.4.3 presents the methods used for the upper-bound DLT analyses. As described in Section G.4.3, these analyses use a mathematical modeling tool (the Transmission Routing and Configuration Estimator, or TRACE) to estimate preferred routings of new transmission lines and the optimal choice of voltages for each line segment. While the TRACE model may provide some potential benefits to re-evaluate or work with different variables as specific SEZs are identified, ultimately, line analysis and flow studies from each SEZ will need to be done. This analysis should be undertaken as part of the ongoing work at the WECC and by other transmission planning entities. The next steps that the agencies propose to take in a coordinated transmission strategy are discussed in Section G.4.4.

G.4.2 Factors Limiting Predictability of Future Transmission Needs for the SEZs

Largely because of federal and state government deregulation of the utility industry and the greater roles of regional transmission organizations (RTOs) and independent system operators (ISOs) in apportioning transmission capacity, there has been great uncertainty in the power-generation industry about how to finance new transmission infrastructure. It became unclear what benefits a utility would derive from bankrolling transmission system upgrades, or how they would be repaid for their investments. Consequently, there has been little investment in transmission over the past 20 years. This situation is very slowly being resolved, with utilities increasingly gaining the confidence to make investments in infrastructure.

Wind and solar developers have shown a strong preference for locating their generation projects near existing transmission lines, especially those with existing capacity, in close proximity to an existing substation. This strategy minimizes the cost of connecting generation projects to the transmission grid and avoids the need to finance transmission system upgrades to create the needed capacity. However, this is not an option for transmission projects in the SEZs that are not located near existing transmission with available capacity.

Establishing transmission, either through use and/or upgrade of existing lines or construction of new lines, generally precedes development of a solar generation project. In order

to acquire project financing, solar developers need a signed Power Purchase Agreement (PPA) and a demonstrated ability to transport that power to the potential purchaser(s). However, arranging for the new and/or upgraded transmission line capacity is an area in which solar developers may not be knowledgeable, and they may not be able to take advantage of the new authorities FERC Order 1000 provides for entities to propose new transmission. If transmission access is not adequately factored into project planning, solar projects may be greatly delayed or become infeasible.

The following factors limit the ability to identify, through a programmatic NEPA document, specific transmission construction needs that would allow solar development in the proposed SEZs, and provide insight into why the mid-range SLT analysis was ultimately considered too uncertain to include in the Final Solar PEIS. These factors should be considered in interpreting the results of the transmission impact assessments presented in Chapters 8 through 13:

- Available transmission capacity in the six-state study area is limited. It is likely that much of the solar generation produced in SEZs would need new or upgraded transmission lines to move power to market. Determining exactly where new transmission lines would be located is problematic, as discussed below.

- By law, requests for capacity on the transmission system are analyzed on a first-come, first-served basis, although in some transmission planning areas this analysis is performed on "clusters" of applicants who apply for transmission service within the same window of time. The applicant, or cluster of applicants, who first encounters a shortage of capacity to meet the planned project's needs must finance whatever system upgrades are necessary in order to create the additional capacity needed. Utilities, ISOs, and RTOs maintain queues to keep track of who applied first; thus, there is an incentive to make a request regardless of how viable a project might be. Therefore, most interconnection queues include a number of unlikely projects, and there is no easy way to separate the truly viable projects from the placeholders. The queues are thus a poor source of information about what projects might be built and when; while this situation may improve with the implementation of FERC Order 1000, it remains a significant issue at present.

- Some transmission projects, particularly those proposed by private developers, are viewed as proprietary information by their proponents for several reasons including, but certainly not limited to concerns about competition for favorable rights-of-way (ROWs) or routes, considerations of cost or funding, or a desire to preserve a competitive advantage (public utilities, which often own most of the ROWs they need and whose financing is typically rate-based, generally do not pose these concerns). When transmission projects are not publicly known, information about the projects cannot be used to help efficiently plan transmission for the SEZs.

- Existing and planned system configurations (e.g., generation, transmission, and load characterizations) have inherent uncertainties. Results from WECC-developed transmission studies provide the most detailed and reliable representations available for characterizing future conditions. Studies prepared by WECC and submitted to the North American Electric Reliability Corporation (NERC) and FERC are a critical part of the process to ensure reliable grid operations. These studies are based on inventories of generating facilities planned to be operating within the 2015 and 2020 time frames. Data from these studies, submitted to the FERC via Form 715 filings (FERC 2011), have been used in the DLT analyses to represent existing and future system configurations.[2] However, it is recognized that all future construction projects have uncertainties with respect to various aspects such as financing, permitting, and load growth to justify new resources, especially over the 20-year study period addressed in this Solar PEIS. As a result, these uncertainties affect the predictability of transmission needs for SEZs.

- The order in which projects proceed, and their relative timing, can have a large impact on how the transmission system develops. A simple example would be solar project development in a given SEZ. If many solar generation projects were developed at the same time or close in time, it is reasonable to assume that the appropriate amount of transmission would be constructed to carry the generation to market. If the same projects were developed singly over a longer period of time, then several smaller transmission lines could result, since there is generally no financing available for overbuilding a transmission line for potential (and uncertain) future projects. The additional SEZ-specific transmission analyses have assumed that all the SEZs would be built out to capacity over a relatively short time period of 5 to 10 years, because reliable data on the transmission system do not extend past the year 2020 (see Section G.4.3). It is important to note that it is unlikely that development within the SEZs will occur at this pace and/or level.

- Solar developers will need to market the output of their projects to potential purchasers. Generally, solar and other energy developers first identify their target power company customers when considering new projects; the location of the target customer is a primary consideration in site selection. The additional SEZ-specific transmission analyses included in the Final Solar PEIS may help developers initially identify potential power companies that

[2] FERC Form 715 is required from each of the three major U.S. interconnections (i.e., the Western, Eastern, and Texas Interconnections). The form contains results from alternating-current (AC) load-flow simulations, including detailed simulations that model the complex balance of loads and generation, with rigorous representations of transmission lines, network connectivity, substations, and other critical equipment. Form 715 filings provide summaries of these simulations and a basis for NERC and FERC to ensure reliable operations of electrical grids. FERC distributes information containing many parameters from the Form 715 submissions to qualifying requestors, but protects portions of the information that are considered sensitive for security or economic reasons.

could be served by projects in each SEZ and begin PPA negotiations with those companies.

G.4.3 Methodology for SEZ-Specific Transmission Analyses

As noted, the Draft Solar PEIS presented an assessment of the minimum, or lower-bound, transmission-related impacts for each SEZ. The additional SEZ-specific transmission analyses presented in Chapters 8 through 13 of the Final Solar PEIS provide assessments of upper-bound impacts assuming new solar electricity generation will require all-new transmission infrastructure; this upper-bound analysis is referred to as DLT analysis. For the DLT analyses, a 10-year study period, extending from 2011 to 2020, was assessed. This time frame was constrained mainly by the load-flow data and facility expansion information available via FERC (2011) for characterizing existing system capacities and flows.

The information generated by the DLT analyses includes the following:

1. Identification and characterization of potential load areas to be served by the SEZ under consideration.

2. Characterization of transmission options for delivering power from the SEZ to the potential load areas and an estimate of the associated requirements in terms of number and length of new transmission lines needed; number of new substations needed; and associated land use requirements, voltage levels, and bundling configurations. (Note: The SEZ-specific transmission analyses treat each SEZ independently. Conducting coordinated transmission development studies that consider multiple SEZs contributing power to the same load centers was determined to be beyond the scope of the Solar PEIS analyses).

3. Identification of optimal and suboptimal transmission solutions for disbursing loads from a given SEZ to surrounding load areas in terms of land use requirements (for both transmission lines and substations) and cost (see Section G.4.3.1.2 for more information).

To identify the potential load areas to be served by SEZs, a mathematical modeling tool, TRACE, was developed to identify the most favorable load areas in terms of satisfying load requirements and minimizing distances from specific SEZs. The analyses were constructed to ensure that the entire amount of new generation projected at each SEZ would be marketed. The estimated generation capacity of each SEZ was calculated by assuming full build-out of each SEZ, (i.e., 80% of the total acreage would be developed). Because of the variable nature of solar generation, the identified load areas need to represent a significantly greater load than is expected to be delivered from a given SEZ (because no load area would depend entirely on solar generation to meet its peak loads).

In order to calculate the number of miles of new transmission construction and acres disturbed, it was assumed that new transmission construction would occur parallel to (but

spatially and electrically separate from) existing ROWs and/or within or along designated corridors. New transmission pathways were estimated only for new line segments connecting the SEZs with nearby existing transmission pathways.

G.4.3.1 Methodology for Identifying Likely Load Areas

The methodology for identifying likely load centers was designed to provide a logical foundation and reproducible basis for associating SEZs with appropriate load areas. The goal was to develop SEZ–load area assignments for each SEZ. The SEZ–load area assignments provided the basis for examining the transmission needs and impacts for all SEZs. The logic and methodology defined below was assembled into the TRACE modeling tool and then applied to the DLT analyses.

G.4.3.1.1 Background

The approach was designed to provide approximations that would be reasonable, but not interpreted as predictive or definitive, in part because of the complex and dynamic transmission development process and also because of limitations in scope. Many commercial entities (utilities, independent transmission developers, and the like), public entities, and governmental entities are involved in planning, financing, permitting, and constructing new transmission lines, and this analysis is not intended to capture those multi-entity dynamics. Likewise, this analysis does not represent a technically rigorous treatment of the load associations, because it does not employ load-flow analysis or optimization techniques that are used by industry to simulate grid flows and optimize cost and pricing issues. Nor does this analysis model the markets for renewable and other energy, or the policy drivers (such as Renewables Portfolio Standards or greenhouse gas regulatory regimes) that affect the extent of demand for solar energy. Such rigorous analysis requires modeling and analysis that is beyond the scope of the Solar PEIS.

Rather, the logic contained in the TRACE model represents the essential physical and economic factors that affect transmission configuration choices and the identification of logical load areas for prospective generation sources. By including considerations for the factors discussed below, the TRACE model is considered to produce reasonable assessments of transmission requirements and associated impacts. This information may provide insight and data for supplying study requests to WECC for additional analysis by the WECC/TEPPC Regional Transmission Expansion Planning 10-year planning process, the WECC's development of its Long-Term Planning Tool (LTPT), and for the WECC Technical Studies Subcommittee reliability studies. On a going-forward basis, the use of the TRACE model will be closely coordinated with the LTPT and other planning efforts, to maximize the benefits of collaborative efforts.

G.4.3.1.2 Basic Considerations and Overview

The following objectives and factors were incorporated into the transmission routing and configuration algorithm:

- Minimizing transmission line costs, between each SEZ generation source and selected load(s);
- Following pathways of existing ROWs or planned corridors;
- Recognizing grid topology as it affects transmission distances, transmission line costs, and identification of favorable routes for constructing new transmission lines and upgrading existing lines;
- Identifying adequate loads to absorb projected SEZ generating capacities;
- Limiting solar-generated assignments for any given load area to a reasonable percentage of the total load for that area;[3]
- Allowing SEZs to serve out-of-state load areas; and
- Identifying two case results: the optimal (least-cost) solution and an alternative suboptimal solution to provide sensitivity indicators. (Note: Due to the large hypothetical capacity of the Riverside East SEZ and the resulting complexity of the solutions, only the optimal solution was presented for this SEZ).[4]

These objectives and factors were integrated into the logic for identifying load areas and transmission requirements for each SEZ. Collectively, they are intended to mimic many of the basic considerations that drive transmission development, without requiring the rigor of detailed load-flow analysis. These items are discussed in greater detail in the following paragraphs.

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[3] The impending Variable Energy Resource Rule from FERC, and the potential development of an Energy Imbalance Market(s), may enable increased solar-generated assignments for given load areas; the potential for increased use of storage and hybridization can also be expected to enable increased solar-generated assignments.

[4] Regarding the "Optimal" (Least-Cost) Solution and an Alternative Suboptimal Solution to Provide Sensitivity Indicators, in addition to constructing the optimal solution for disbursing loads from a given SEZ to surrounding load areas, the DLT analyses also present the results for alternative suboptimal cases by excluding the "primary" load area that was selected in the optimal result. In this context, the "primary" load area was defined as the load area that was assigned the largest portion of SEZ capacity in the optimal solution. The purpose of each secondary solution was to provide insights into the sensitivity of the costs and land use impacts to the optimal routing configurations. For scoping purposes, these alternative cases provide additional indicators for transmission costs and impacts under varying possible strategies and offer initial insights into issues surrounding simultaneous SEZ site development (not addressed directly in this study).

Minimizing Transmission Line Costs for Connections between Generation Source and Designated Load(s). Transmission distance is one of the strongest factors affecting transmission costs and line losses. In many cases, minimizing transmission distances results in the lowest costs for transmission equipment. However, depending on the grid configuration, available pathways, and the layout of eligible loads, optimal transmission strategies can, in some cases, involve moving power greater distances to avoid congestion, take advantage of clustered load areas, or reach higher value markets. The TRACE model minimizes total new-line costs for the DLT analyses, subject to the other constraints for assembling a valid collection of loads. The TRACE tool provides solutions that examine potential trade-offs in line capacities, line routings, and loads selected for deliveries from a given SEZ. The TRACE applications for this study do not distinguish between different market values at different load areas, because that feature was beyond the scope of this effort.[5]

Following Pathways of Existing ROWs or Planned Corridors. The identification of load areas for each SEZ recognizes that existing lines provide favorable pathways. The incremental environmental impacts of expanding existing lines/ROWs are typically much lower than those associated with developing entirely new pathways. There are numerous alternatives for adding capacity along existing transmission pathways: adding new circuits/conductors to spare positions on existing structures; reconductoring the lines with high-temperature, low-sag conductors; making voltage upgrades; and/or widening the ROW to accommodate new circuits and structures. However, while the incremental cost per mile of upgrading capacity of existing transmission may appear low relative to adding new capacity, the cost per megawatt (MW) of the resulting capacity may well not be less than that of adding a new line. New lines add capacity above the full capacity provided by existing lines, which remain in operation, while upgrades add only an increment above that preexisting capacity, replacing those transmission elements that had been in operation. The DLT analyses use existing pathways as guides for candidate transmission-line routings, assuming new line additions along these pathways. The costs and impacts for new line options are characterized in sections that follow.

Recognizing Grid Topology As It Affects Transmission Distances, Costs, and Identification of Favorable Routes for New Lines. "Incremental" transmission distances are recognized in the analysis for interconnected load areas. For example, if two load areas are reachable along a single transmission line, the load selection logic recognizes that if both loads are to be connected, the more-distant load area only incurs an incremental transmission distance and cost to link the nearer load area to the more-distant load area. Recognizing interconnection dependencies affects the selection of the most favorable load areas to be served by a given SEZ. TRACE recognizes these dependencies and derives the optimal paths and optimal collections of loads to be served by each SEZ.

Identifying Candidate Loads.

(a) **Identifying Adequate Loads to Accommodate Planned SEZ Generating Capacities**. For each SEZ, an adequate collection of load areas is needed to

[5] Results of studies assessing the variability of market values for different load areas could be incorporated into the methodology at a later date.

accommodate the estimated solar-generating capacity for the SEZ being evaluated. In cases in which surrounding load areas represent small loads, this consideration means that numerous load areas are identified for a given SEZ. Limits that each load area would adopt in the use of renewable or solar power [see item (b) below] will also affect the number of load areas needed to accommodate generation from each SEZ.

(b) ***Limiting Solar-Generated Load Assignments for Any Given Load Area to Represent a Reasonable Percentage of the Total Load for That Area***. For a given load area, only a portion of total peak load is considered "eligible" to be served from an SEZ. This consideration recognizes that each load area would limit its exposure to variable loads as derived from solar generation sources. A uniform factor of 20% was applied to each load area.[6] Peak load estimates for load areas were approximated from a simple scalar based on population (400 persons per MW as described in sections that follow). This approximation approach was adopted to simplify the estimations of load magnitudes for aggregate load areas in the vicinity of various SEZs.[7]

Allowing SEZs To Serve Out-of-State Load Areas. This assumption allows the SEZs to serve both in-state and out-of-state loads. In practice, there may be limitations on serving out-of-state loads due to state-specific policies. The sensitivity of results to this assumption can be addressed easily with additional case studies.

G.4.3.1.3 Implementation

The SEZ–load area assignment logic was solved by using a mixed-integer linear programming formulation. By defining the factors outlined above, the TRACE model identifies the most cost-effective collection of load areas for each SEZ. The formulation is flexible in terms

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6 The factor of 20% was used for purposes of consistency and might be higher or lower in practice. Higher solar-eligible loads may be acceptable for individual load areas in the future, for example, if new, reliable and cost-effective storage technologies become available. A sensitivity analysis for the eligible load assumption is presented for the Riverside East SEZ, where an analysis for a factor of 30% is presented in addition to the 20% assumption. This method does not consider that a percentage of the load may already be served by solar generation through pre-existing contracts. It is also important to note that the methodology allocates load share to each SEZ on a serial basis, one at a time, and does not account for how any given load would be served by multiple SEZs (i.e., this model may allocate the same 20% load share to more than one SEZ); see the discussion of the "objective function" in G.4.3.1.3.

7 While WECC load-flow information provides an alternate source for estimating loads, there were several reasons why the population approximations were adopted. First, WECC load-flow data are reported with significantly higher resolution (by substation) than appropriate for the transmission methodology that was adopted. Second, the WECC substation-level load data available from FERC are not accompanied by spatial location data, so aggregating WECC data to coincide with aggregate load areas used for this transmission analysis would have been difficult. And third, spatial cross-referencing information was eventually acquired to support extensions to this analysis (for the SLT analysis), but the purpose of those data was to facilitate the quantification of flows on existing lines, not to characterize the aggregate load areas.

of potential modifications or enhancements once initial test cases are prepared and reviewed. In general, the algorithm was formulated as a cost minimization problem, subject to constraints, to ensure that adequate loads are designated to accommodate the solar-derived generation from a given SEZ.

Objective Function. The SEZ-specific transmission analyses treat each SEZ independently. Conducting coordinated transmission development studies that consider multiple SEZs contributing power to the same load centers was determined to be beyond the scope of the Solar PEIS analyses. However, a discussion of the likelihood of potential impacts from the concurrent development of multiple SEZs is included in Section G.4.3.4.

Constraints. The following rules and relationships were used in determining the optimal solution:

- The sum of "solar-eligible" loads from all chosen load areas must be greater than or equal to the total SEZ generating capacity (i.e., they must accommodate the full capacity of each SEZ as expressed in MW).

- The SEZ-eligible load for each load area must equal the load area peak load multiplied by 20%.

- Existing/planned ROWs and corridors to in-state and out-of-state load areas must be followed. Network connectivity and "incremental" distances to load areas located along ROWs/corridors that serve other load areas must be recognized (i.e., allow transmission routings to take advantage of supporting delivery capabilities based on preceding line segments).

- Line voltages (in kilovolts [kV]) selected for each transmission segment must be supported by equal or greater voltages on preceding segments.

The total capacity (in MW) of power delivered over each segment (to all load areas served or supported by that segment) must be supported by adequate line capacity as determined by the line voltage selected for that segment. Higher line voltages incur higher costs in an absolute sense, but may incur less cost when normalized for the amount of power they serve (i.e., on a $/MW basis, higher line voltages may or may not be more expensive); in general, the TRACE model attempts to choose the lowest possible line voltages to satisfy load delivery requirements. Because line voltages directly affect the capacity of transmission lines, the model must select high-enough voltages to deliver all the SEZ capacity to load areas. TRACE examines all the possible combinations for voltage selections on each segment of the network, and optimizes the choices to achieve minimum costs.

The end product of this process is a list of logical load areas, transmission line routings, and transmission line voltages for each line segment linked to, and served by, a given SEZ. These results were used to summarize the distances and costs for:

- Transmission tie-lines to connect with the existing grid; and

- New transmission capabilities (parallel to [but spatially and electrically separate from] existing/planned ROWs).

Figure G.4-1 provides a graphical depiction of the DLT load area and line voltage optimization framework represented in TRACE for the Brenda SEZ. This illustration conveys the critical factors that affect load area selections, including network connectivity, distances for each candidate line segment (mi), locations and magnitudes of solar-eligible loads (MW), capacity of the SEZ, and candidate line voltages (kV) for each line segment. Candidate line voltages range from 138 to 765 kV and are discussed in greater detail below. Figure G.4-1 portrays a case in which eight line options are considered. For the largest SEZs in this study, some of the cases considered a total of 10 line options.

G.4.3.2 Transmission Analysis Methodology

Subsequent to the identification of potential load areas as described in Section G.4.3.1, the following additional assumptions, methods, and data sources presented in Section G.4.3.2.1 for the DLT analysis methodology were used in identifying new transmission facilities that would be needed for individual SEZs and for estimating the environmental impacts and costs of these facilities.

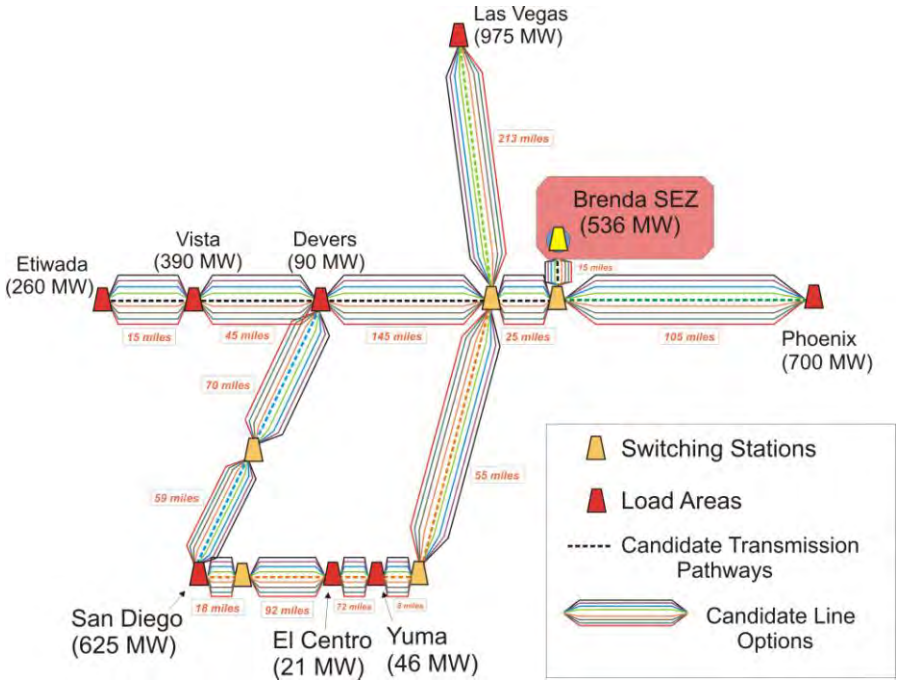

FIGURE G.4-1 Schematic Representation of DLT Load Areas, Solar-Eligible Loads, and Line Voltage Optimization Framework

G.4.3.2.1 Dedicated Line Transmission (DLT) Analysis Methodology

The purpose of the DLT analysis is to establish a reasonable upper bound of potential impacts of transmission development associated with solar development in the SEZ in terms of land disturbance and costs. The total load, in MW, for each load area, was approximated by assuming a population-to-power density (P-P-D) of 400 people per MW (Portante et al. 2011). Since population is the most common parameter associated with a market area, the use of P-P-D is a convenient means of calculating the equivalent megawatt load given the population.

The DLT analysis assumes that all SEZ-generated power will require entirely new transmission lines. Where existing transmission lines are present, it is assumed that the new dedicated lines would be constructed parallel to the existing lines (see Section G.4.3.1.2) leading to the identified potential load areas and that they would require additional land for ROWs. The new transmission lines are assumed to connect the identified potential load areas in sequence according to linear distances initiating from the center of the SEZ and following the network layouts guided by existing pathways. Sufficient load areas were assembled for each SEZ analysis to significantly exceed the maximum MW output for that SEZ. The goal was to provide significant alternatives for each case and allow TRACE to identify the preferred solutions (based on cost minimization).

The DLT analysis results are considered to represent upper bounds because they require construction of all new transmission lines. These same findings are considered reasonable in that they identify the most cost-effective strategies for pursuing all new construction. The goal was to identify transmission configurations that make efficient use of land and equipment investments and that provide full capabilities for distributing all the anticipated SEZ capacity.

The data resources for the DLT analyses were as follows:

- Information about the proposed SEZs and potential generation levels as presented in the Final Solar PEIS and associated spatial data (available at http://solareis.anl.gov/maps/index.cfm);

- WECC systems map and load flow data for the years 2010, 2015, and 2020 under peak summer demand (FERC 2011);

- WECC pathway reports for calibration adjustments to line capacity estimates: for example, *10-Year Regional Transmission Plan, WECC Path Reports, September 2011* (WECC 2011) (Note: These reports deal with aggregate pathway assessments rather than individual line characterizations, and therefore, have greatest value for larger-scale analyses that would be conducted to assess simultaneous development of multiple SEZs, with overlapping competition for available loads. As discussed in Section G.4.3.4, the analysis of simultaneous development of the SEZs was determined to be beyond the scope of the Solar PEIS.);

- POWERmap data (Platts 2011) for initial load area identification and population estimates;

- Census data (U.S. Bureau of the Census 2010) for city and metropolitan area population figures;

- The Electric Power Research Institute (EPRI) *Transmission Line Reference Book* (EPRI 2005); and

- Various technical publications from the Institute of Electrical and Electronics Engineers, EPRI, WECC, and other organizations (CUS 2010; AEP 2010).

Major assumptions employed in the analyses were as follows:

1. The DLT results represent implications for the 2015 to 2020 time frame. Because entirely new lines are assumed to be constructed and no available capacity on existing lines is assumed to be utilized, the DLT analysis is not closely tied to future year-specific estimates of flows on existing equipment.

2. Where possible, transmission lines that require new construction were assumed to run parallel to (but spatially and electrically separate from) existing transmission routes.

3. Land use requirements for transmission line ROWs, which vary by voltage level, were developed from literature sources (see Table G.4-1). Land use requirements for substations were assumed to be 950 ft^2 (88.3 m^2) per megavolt-ampere (MVA).

4. The project generation capacity for each SEZ is assumed to remain constant over the planning horizon.

5. As the value of a dollar spent on investing in a potential transmission line project is worth less in the future than it is at the beginning of a project or before a project is begun, the changing value of a dollar over time must be incorporated into the analysis, particularly in the case where multiple projects with differing timelines are being evaluated. Accordingly, a discount rate can be used to represent the time value of investment funds, allowing the net present value (NPV) of each transmission line project to be calculated in order

TABLE G.4-1 Summary of Transmission Line Characteristics (for 50-mi [80 km] and 200-mi [321.8 km] distances)

Option	Line Configuration[a]	Distance (mi)[b]	Cost ($M/mile)	ROW (ft)[c]	Thermal Limit (MW)[d]	Practical Loadability (MW)[e]	Maximum Capacity (MW)[f]	Maximum Design Capacity with 10% Safety Margin (MW)[g]
1	1-138 kV Bof1	50	0.61	80	150	156	150	135
2	2-138 kV Bof1	50	0.76	80	300	313	300	270
3	1-230 kV Bof1	50	1.10	150	396	413	396	356
4	1-345 kV Bof2	50	2.20	175	1,170	1,220	1,170	1,053
5	2-345 kV Bof2	50	2.50	175	2,400	2,502	2,400	2,160
6	1-500 kV Bof3	50	3.50	200	2,730	2,846	2,730	2,457
7	2-500 kV Bof3	50	4.38	200	5,400	5,630	5,400	4,860
8	1-765 kV Bof4	50	4.50	200	6,630	6,912	6,630	5,967
9	2-765 kV Bof4	50	5.60	200	13,260	13,825	13,260	11,934
10	4-765 kV Bof4	50	11.20	400	26,520	27,650	26,520	23,868
1	1-138 kV Bof1	200	0.61	80	150	64	64	57
2	2-138 kV Bof1	200	0.76	80	300	127	127	114
3	1-230 kV Bof1	200	1.10	150	396	168	168	151
4	1-345 kV Bof2	200	2.20	175	1,170	496	496	446
5	2-345 kV Bof2	200	2.50	175	2,400	1,018	1,018	916
6	1-500 kV Bof3	200	3.50	200	2,730	1,158	1,158	1,042
7	2-500 kV Bof3	200	4.38	200	5,400	2,290	2,290	2,061
8	1-765 kV Bof4	200	4.50	200	6,630	2,811	2,811	2,530
9	2-765 kV Bof4	200	5.60	200	13,260	5,622	5,622	5,060
10	4-765 kV Bof4	200	11.20	400	26,520	11,245	11,245	10,120

Footnotes on next page.

TABLE G.4-1 (Cont.)

[a] For line configurations, the notation corresponds to the following examples:
1-138 kV Bof1 = single-circuit, 138-kV line, with a bundle-of-one conductor;
2-138 kV Bof1 = double-circuit, 138-kV line, with a bundle-of-one conductor;
1-345 kV Bof2 = single-circuit, 138-kV line, with a bundle-of-two conductors; and
2-500 kV Bof3 = double-circuit, 500-kV line, with a bundle-of-three conductors.
765 kV line configurations are not currently utilized in the Western Interconnect; they are used in the Eastern Interconnect and extend across parts of eastern Canada, Illinois, Indiana, Kentucky, New York, Ohio, Virginia, and West Virginia.

[b] Distance is the length (mi) for a given transmission segment; to convert mi to km, multiply by 1.6093.

[c] ROW is the required width (ft) of each right-of-way; to convert ft to m, multiply by 0.305.

[d] Thermal limit is the capacity (MW) of the line based strictly on thermal considerations (ignoring voltage issues).

[e] Practical loadability represents the line capacity (MW) as dictated by voltage stability factors.

[f] Maximum capacity is the lower of two factors (thermal limit and practical loadability) and is expressed in megawatts. Depending on the transmission distance, either of the two factors (thermal or voltage) can represent the more limiting factor.

[g] Maximum design capacity with 10% safety margin is the maximum capacity value multiplied by 90%, where 10% is introduced as a safety margin so that a line option that might require loading up to the maximum allowable capacity is not selected.

to meaningfully compare the multiyear cost of transmission line projects at a single point in time.[8]

6. For estimating loads, population estimates for smaller load areas were based on 2010 city population data obtained from the U.S. Bureau of the Census (2010). For larger load areas, the population estimates were initially based on city populations, but then most of these were expanded to represent metropolitan areas, thus capturing not only the loads within city boundaries but also loads from adjacent communities. Metropolitan area 2010 population data were obtained from the U.S. Bureau of the Census (2010).

7. As a simplifying approach to recognizing the variable nature of solar generation, load areas were assumed to have a maximum supply from SEZs of 20% of their total estimated loads (i.e., 20% of the load would be eligible to be served by solar power). Thus a load area with a total load of 1,000 MW was assumed to represent only 200 MW of potential load for new solar power generated in the SEZs. This consideration recognizes that each load area would limit its exposure to variable generation as derived from solar sources. As stated in Section G.4.3, the amount of solar power from an SEZ that individual load areas eventually purchase will vary based on the capacities supplied by other renewable sources, technical reliability and integration issues, and state and federal regulations mandating the use of solar power.[9]

8. In order to estimate transmission infrastructure requirements, it was assumed that one substation would be installed at each load area and an additional one at the SEZ. Thus, in general, the total number of substations per scheme is simply equal to the number of load areas associated with the scheme plus one. Substations at the load areas will consist of one or more step-down transformers, while the originating substation at the SEZ will consist of several step-up transformers. For schemes that require the branching of the lines, a switching substation is assumed to be constructed at the pertinent junction. The originating substation would have at least a combined substation rating to match the SEZ's output, while the combined load substations would have a similar total rating.

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[8] The discount rate of 5% that was used is consistent with values recommended by the Federal Highway Administration (FHA 2012). The estimated NPV of the various transmission configurations takes into account the cost of constructing the lines, the substations, and the projected revenue stream over the 10-year study period, assuming the price of electric energy to be constant at about $100/MWh. Only investment costs for the transmission lines and substations were considered in this study; maintenance costs were neglected to simplify the analysis. A positive NPV indicates that the revenue from any given project would at least offset project construction costs.

[9] It is important to note that the 20% assumption does not take into consideration the amount of solar already serving, or under contract to serve those load areas.

A total of 10 transmission line options were considered in the DLT analysis. The options range from 138 to 765 kV, with different bundling and numbers of circuits, offering a wide range of capabilities and costs for selection in the TRACE model. Initially, the list included 16 options, but this was trimmed to a smaller representative set of capabilities and costs.

The capacities for each line option were determined by using line "loadability" curves provided by American Electric Power (AEP 2010). The maximum design capacity for each option recognizes that there are thermal limits to line loading, voltage stability limits (especially with larger transmission distances), and safety margins to be observed. Additionally, the estimated land requirements for each line option are included (AEP 2010; Western 2009).

Table G.4-1 provides a summary of transmission line characteristics for distances of 50 mi [80 km] and 200 mi (321.8 km]. The entries clearly illustrate how line capacities are greatly affected by distance. These point estimates are for illustration, and in the actual SEZ analyses, line capacities are represented with continuous functions (AEP 2010) that are solved for the unique distances associated with each transmission segment.

The line options in Table G.4-1 represent variables that the TRACE model can use to examine alternative connectivity between the various load areas and a given SEZ. The multiline depictions in Figure G.4-1 are intended to portray the possibilities for alternative line voltages, number of circuits, and conductor bundling. TRACE considers all the possibilities for linking the load areas to SEZs, using these line options in conjunction with the constraints outlined in Section G.4.1 under the subheading "Implementation."

G.4.3.2.2 Limitations to the DLT Analysis

Although DLT analyses are useful in determining high-end costs and high-end impact estimates for the Solar PEIS, these analyses do have shortcomings. The assumption that new lines would run parallel to existing transmission lines, while appropriate in this programmatic analysis, is somewhat restrictive. Alternative routings for new lines may be feasible and favored in many areas, and existing transmission lines may offer opportunities for conveying SEZ power without constructing all-new lines.

Following existing transmission pathways does have the advantage of reducing the potential for routing transmission lines across exclusion areas, sensitive environmental areas, or other contested pathways, but it also precludes examining possible favorable routes that might be more direct than those considered. So while the DLT analysis did not include any areas of known dispute, in some cases it probably overestimates the costs of new line construction because of the approach used for routing along existing pathways.

In addition, the DLT approach assumes that all existing transmission lines in the WECC region are saturated and have little or no available capacity to accommodate an SEZ's output throughout the entire 10-year study period. The DLT approach allocates load share to each SEZ on a serial basis, one at a time, and does not account for how any given load would be served by multiple SEZs (i.e., this model may allocate the same 20% load share to more than one SEZ).

The method also does not consider that a percentage of the load may already be served by solar generation through pre-existing contracts.

The assumption that electricity prices are uniformly $100/MWh simplifies the calculations, but overlooks possible regional differentials in pricing. Because TRACE currently optimizes transmission routings based on new-line costs, this factor does not affect the outcomes. However, a straightforward extension of TRACE would be to recognize regional differentials in electricity pricing and include revenues explicitly in the objective function. This would mean that "optimal" routings would balance costs of reaching different load areas against revenues obtained from making those connections.

G.4.3.3 Testing and Review of DLT Methodology

On the basis of comments received on the Draft Solar PEIS, a test case of the DLT methodology was prepared to demonstrate the effectiveness and usefulness of the planned approach for conducting additional transmission analyses for the Final Solar PEIS. The proposed Brenda SEZ, located in Arizona, was selected for testing because it represents a nontrivial combination of grid connection and delivery-to-load options that test the planned approach. The Brenda SEZ case study was released for public review as part of the Supplement to the Draft Solar PEIS. The approach and preliminary results were reviewed and commented on by a wide array of stakeholders. Adjustments were made in response to comments, and the approach was refined. The transmission analysis methodology described in the Supplement to the Draft PEIS has been changed as follows:

- Projected pathways and transmission schemes were optimized on the basis of estimated costs, rather than on the basis of distance, providing a more reasonable representation of fundamental forces affecting transmission development;

- Load-area selections were coupled with line-routing analysis (integrated into the TRACE modeling tool), greatly improving representations of possible load-area configurations because these two aspects are closely interrelated;

- More options for line voltages and capacities were introduced into the load area selection process and the line-routing analysis (the initial methodology and test cases used a single 500kV line option), providing reasonable power-system representations scaled to specific areas;

- Line voltage, number of circuits, and bundling options were explicitly optimized for each line segment, which, for the more complex network cases, improves on the originally planned manual approach in terms of finding the most favorable combinations of line options and load selections and yields reproducible and verifiable outcomes;

- Voltage stability factors were integrated into the estimation of line limits, which provides more reasonable representation of line capabilities, reduces or avoids overestimates using strictly thermal limits, and explicitly captures line-capacity dependencies on line distances;

- Voltage-stability factors were fully integrated into the routing and configuration logic (i.e., the TRACE model), ensuring consideration of factors directly affecting routings, line selections, costs, and land-use impacts;

- Accurate spatial data (i.e., actual geographical locations for substations) were acquired and cross-indexed with FERC Form 715 data, which greatly improved the fidelity of network connectivity representations;

- More accurate assessments of capacities for existing and planned lines were acquired, recognizing both thermal and stability factors; and

- Base case and secondary cases were developed to support sensitivity analyses.

The Brenda case study was performed manually while TRACE was being constructed and refined. Subsequently, the TRACE tool was tested against the manually generated case results, providing opportunities to confirm basic functionality and to replicate known solutions for intuitive smaller cases. Once tested and validated, TRACE was applied to each of the SEZs for the DLT assessments. Use of the model was particularly valuable for the more complex cases in which the preferred configurations of loads and line options were not obvious. In some cases, non-intuitive solutions have yielded insights and guidance to configurations that would have been difficult or unlikely to construct without the tool.

G.4.4 Transmission Analysis – Next Steps

The Solar PEIS contains the environmental impact analysis necessary to support the planning and policy decisions that form the Program which will guide utility-scale solar energy development on BLM-administered lands. This Program includes the identification of SEZs in which the BLM will prioritize and incentivize utility-scale solar energy development. In order to realize Program success, it is important for both the BLM and the solar development community to understand the capabilities of an identified SEZ to support future development and to have a reasonable expectation of what development can ultimately be expected from a SEZ.

In order to accommodate concerns that the Draft Solar PEIS did not adequately account for potential environmental impacts from transmission lines needed to support the development of solar development within the SEZs, the agencies expanded the scope of the transmission analysis in the Final Solar PEIS to include an upper-bound scenario for transmission development. Adequacy of NEPA analysis, however, is very different from actually planning and constructing transmission lines to SEZs. The agencies recognize that the Solar PEIS itself can only go so far to address the real needs of industry, but are committed to facilitating transmission to SEZs as an essential part of the BLM's ongoing program.

The BLM is committed to developing a set of guiding principles and corresponding process steps that will help ensure that current and future SEZs have the transmission infrastructure necessary to support full-scale project development. These steps will be a component of the established Solar Energy Program. The timing of implementing such steps must be given careful consideration due to the inherent limitations of predicting future transmission needs (e.g., the order in which projects proceed, and their relative timing, can have a large impact on how the transmission system develops). Facilitating transmission to SEZs will require the BLM to more actively engage in regional transmission planning efforts coordinated through WECC and the CAISO.

With respect to more targeted involvement in the WECC/TEPPC effort specifically, the BLM proposes the following steps:

- Identify the MW potential in each SEZ both at a time point for the theoretical maximum level (e.g., for the year 2050) and at an expected level at a mid-term date (e.g., for the year 2030).

- Engage in appropriate WECC/TEPPC subcommittees, including the Technical Advisory Subcommittee, Data Work Group, Studies Work Group, and the Scenario Planning Steering Group, to ensure SEZ development is adequately considered and planning cases are appropriately designed.

- Work with the Western Area Power Administration and other federal, state and/or local entities to identify potential transmission opportunities that may not be included in the subregional plans or TEPPC plans. Model incremental injections and withdrawals for each SEZ and for a collection of SEZs (i.e., an SEZ portfolio). This may be done by WECC as part of its annual TEPPC process or by a consultant that is familiar with WECC planning methods and working with key WECC committees and subcommittees.

- Identify violations requiring mitigation, if any, using standard WECC planning criteria and estimate of mitigation costs (incremental transmission lines, reactive power support, etc).

Working through regional planning processes and closely coordinating with other federal, state, and/or local agencies that may have a role in transmission planning, development, or financing will help ensure appropriate consideration of transmission to serve the SEZs. It is important to note that there are limitations, particularly from a timing perspective, to engaging solely in the WECC/TEPPC. Efforts will be made by the BLM to actively participate in the WECC sub-regional planning efforts, specifically in those sub-regions where viable zones are located (e.g., Southwest Area Transmission, California Transmission Planning Group, Sierra, etc.). Additionally, the BLM will seek to better engage in FERC Order 1000 planning and discuss the option of placing priority on federal renewable energy zones within the context of compliance with that Order.

The BLM is proposing to undertake a variety of activities to help steer future utility-scale solar energy development to the SEZs (see Section 2.2.2.2.3 of the Final Solar PEIS). The following incentives are intended to facilitate the permitting of needed transmission to SEZs. The BLM will work with industry, transmission entities, and other stakeholders to identify the most viable SEZs and prioritize the implementation of the items below accordingly:

- The Final Solar PEIS includes a more detailed evaluation of the potential transmission needs and impacts for anticipated solar development within the SEZs. This evaluation is intended to provide a better estimate of the potential environmental impacts of bringing transmission to the SEZs.

- The BLM will continue to evaluate transmission needs for the currently proposed SEZs, including consideration of available capacity on existing lines and the need for new or modified corridors; efforts will also be made to proactively plan for any new or expanded corridors that may be needed to serve currently proposed SEZs.

- As part of the identification process for new or expanded SEZs, the BLM will simultaneously evaluate their transmission needs, including the need to designate new corridors or modify existing corridors (e.g., modify widths, modify locations). Corridor modifications or designations may be achieved through a joint land use planning and NEPA process to the extent practicable (see Appendix A, Section A.2.6).

- The BLM will offer incentives to projects that propose to bring transmission to SEZs (e.g., facilitated permitting of needed gen-ties, transmission lines, and upgrades by Renewable Energy Coordination Office staff, and identification of priority transmission projects that will get facilitated permitting).

- The BLM will commit staff from the BLM's Renewable Energy Coordination Offices and Teams to engage in ongoing and comprehensive regional transmission planning efforts, as well as sub-regional transmission planning affecting SEZs, to ensure the recognition of SEZs as a priority in transmission development. For example, the BLM will identify a BLM liaison to WECC and the appropriate sub-regional planning groups, as well as to the CAISO.

- The BLM will seek to establish cooperative agreements, Memoranda of Understanding and/or Memoranda of Agreement with federal, state, local, and regional agencies, and tribes as appropriate to expedite permitting of needed transmission to support SEZ development.

- As part of the ongoing evaluation of the currently proposed SEZs, as well as the identification process for new or expanded SEZs, the BLM will consult with state and regional transmission planning and coordination authorities, state public utility commissions, state energy offices, and transmission system operators to evaluate available capacity on existing and proposed lines and to

discuss other potential transmission-related barriers. Additionally, the BLM will use its participation in WECC and sub-regional planning efforts to help inform the evaluation of currently proposed SEZs and the identification of new or expanded SEZs.

- As part of the Solar PEIS, the BLM has requested that the currently proposed SEZs be reviewed as a case study by the TEPPC of the WECC as part of the 2012 Study Program. The Draft 2012 Study Program shows that request has been prioritized as high, meaning that it will be studied in the first round of TEPPC cases.[10]

- For all new or expanded SEZs, the BLM will submit study requests for timely TEPPC analysis as appropriate.

- In preparing parcels in SEZs for competitive offer, the BLM will seek to make the most efficient use of existing corridors, consider opportunities for co-location, and avoid geographically stranding future projects from key transmission interconnection points.

G.4.5 References for the Additional Transmission Analysis

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this Final Solar PEIS. It is likely that at the time of publication of this Final Solar PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this Final Solar PEIS.

AEP (American Electric Power), 2010, *Transmission Facts*. Available at http://www.aep.com/about/transmission/docs/transmission-facts.pdf. Accessed July 2010.

CUS (Capitol Utility Specialist), 2010*, Creekview Technical Dry Utilities Study*, El Dorado Hill, Calif., Nov.

EPRI (Electric Power Research Institute), 2005, *AC Transmission Line Reference Book—200 kV and Above,* 3rd ed., 1011974, Final Report, Palo Alto, Calif.

FERC (Federal Energy Regulatory Commission), 2011, *FERC Form 715: Load Flow Data Set for Western Electricity Coordinating Council,* transmitted by D. Burnham (FERC) to Argonne National Laboratory, July 2011.

[10] The TEPPC analysis process is an existing, formal, biennial process used by WECC to access system impacts across the interconnection when adding resources and/or transmission. It analyzes system congestion and system performance under reliable system operating criteria.

FHA (Federal Highway Administration), 2012, *Economic Analysis Primer*. Available at http://www.fhwa.dot.gov/infrastructure/asstmgmt/primer03.cfm. Accessed April 5.

Platts, 2011, POWERmap, Strategic Desktop Mapping System, The McGraw Hill Companies. Available at http://www.platts.com/Products/powermap.

Portante, E.C., et al., 2011, "EPfast: A Model for Simulating Uncontrolled Islanding in Large Power Systems," in Proceedings of the 2011 Winter Simulation Conference, edited by S. Jain et al., Phoenix, Ariz., Dec. 11–14.

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Western (Western Area Power Administration), 2009, *Transmission Line Electrical Design Manual, Section IX – Right-of-Way*, Section IX, Aug.

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APPENDIX H:

UPDATE TO FEDERAL, STATE, AND COUNTY REQUIREMENTS POTENTIALLY APPLICABLE TO SOLAR ENERGY PROJECTS

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APPENDIX H:

UPDATE TO FEDERAL, STATE, AND COUNTY REQUIREMENTS POTENTIALLY APPLICABLE TO SOLAR ENERGY PROJECTS

Appendix H of the Draft *Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States* (Solar PEIS) included a series of tables listing the major federal and state laws, county ordinances, and Executive Orders that establish requirements for permits, approvals, or consultations that may apply to the siting, construction, operation, and decommissioning of solar energy and transmission line projects on U.S. Department of the Interior (DOI) Bureau of Land Management (BLM)-administered lands. The general application of these authorities and other regulatory considerations associated with such siting, construction, operation, and decommissioning were discussed in Chapter 3 of the Draft Solar PEIS.

Each table presented in Appendix H of the Draft Solar PEIS included the citations for the general governing authorities. Under each authority, the lead federal or state agency may have promulgated implementing regulations that set forth detailed procedures for permitting and compliance. County zoning or land use ordinances may also contain specific requirements related to these impact categories.

Only the governing authorities were included in Appendix H of the Draft Solar PEIS; applicable regulations and policies were not included in order to manage the length of the document. The information provided in the Draft Solar PEIS was current as of January 6, 2010; some federal, state, and county requirements may have changed since that time. Additional requirements established at the state or county level (e.g., in general or master plans) may also apply to solar energy development and transmission line projects.

In this update to Appendix H for the Final Solar PEIS, the information that was provided in Appendix H of the Draft Solar PEIS is being summarized; no additional information on regulatory requirements is being provided. Developers of solar energy facilities will be required to update the list of applicable federal, state, and county requirements in preparation for development of individual projects on public lands.

The tables in Appendix H of the Draft Solar PEIS listed major federal and state laws, county ordinances, and Executive Orders for the following environmental considerations:

- Table H-1, Air Quality
- Table H-2, Cultural Resources
- Table H-3, Ecological Resources
- Table H-4, Energy Projects

- Table H-5, Floodplains and Wetlands
- Table H-6, Groundwater, Drinking Water, and Water Rights
- Table H-7, Hazardous Materials and Toxic Substances
- Table H-8, Hazardous Wastes
- Table H-9, Land Use
- Table H-10, Noise
- Table H-11, Paleontological Resources
- Table H-12, Pesticides and Noxious Weeds
- Table H-13, Solid Waste
- Table H-14, Source Water Protection
- Table H-15, Water Bodies and Wastewater

APPENDIX I:

UPDATE TO ECOREGIONS OF THE SIX-STATE STUDY AREA AND LAND COVER TYPES OF THE PROPOSED SOLAR ENERGY ZONES

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APPENDIX I:

UPDATE TO ECOREGIONS OF THE SIX-STATE STUDY AREA AND LAND COVER TYPES OF THE PROPOSED SOLAR ENERGY ZONES

Appendix I of the Draft *Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States* (Solar PEIS) presented information on ecoregions within the six-state study area. An ecoregion is defined as an area whose ecosystems have a general similarity and is characterized by the spatial pattern and composition of its biotic and abiotic features, including vegetation, wildlife, geology, physiography, climate, soils, land use, and hydrology (EPA 2007a).

The information presented in this update to Appendix I for the Final Solar PEIS supplements, but does not replace, the information provided in the corresponding Appendix I in the Draft Solar PEIS. Ecoregions of the United States as mapped and described by the U.S. Environmental Protection Agency (EPA) were presented in Appendix I of the Draft Solar PEIS as the basis for describing visual resources and ecosystems at a general level.

Figure I-1 shows the Level III ecoregions covering the six-state study area. A layer showing these ecoregions is available on the Solar Energy Environmental Mapper Web site (Solar Mapper; available at http://solarmapper.anl.gov/solarmapper) along with layers showing the Solar Energy Zones (SEZs) and variance lands proposed in the Final Solar PEIS. The Solar Mapper tool can be used to determine the relationships between the proposed SEZs and variance lands and Level III ecoregions.

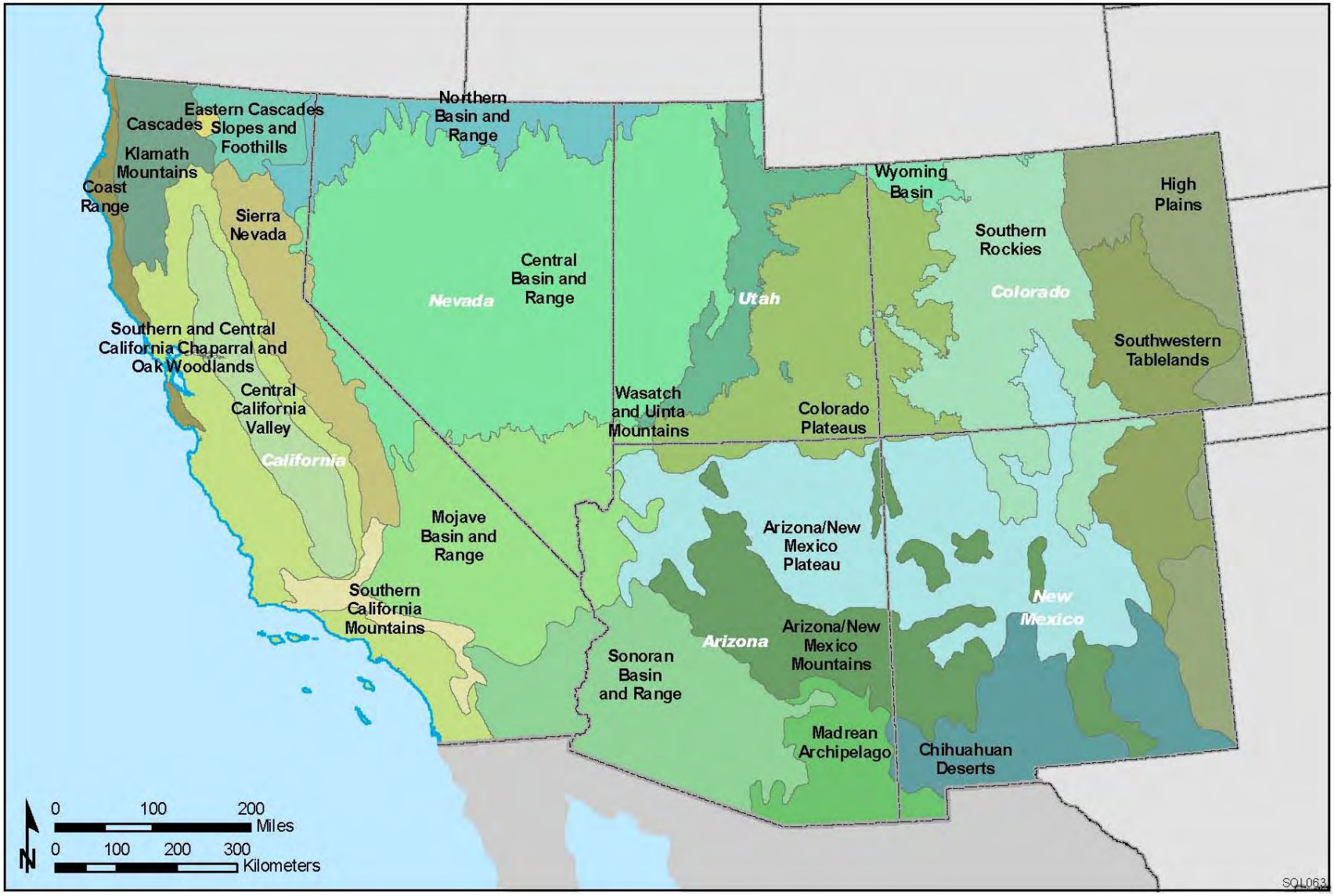

FIGURE I-1 Level III Ecoregions in the Six-State Study Area (Source: EPA 2007b)

REFERENCES FOR UPDATED APPENDIX I

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

EPA, 2007a, *Level III Ecoregions*, map, Western Ecology Division, Corvalis, Ore. Available at http://www.epa.gov/wed/pages/ecoregions/level_iii.htm. Accessed Oct. 2, 2008.

EPA, 2007b, *Level III Ecoregions*, map, Western Ecology Division, Corvalis, Ore. Available at http://www.epa.gov/wed/pages/ecoregions/images/useco_key.jpg. Accessed Oct. 2, 2008.

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