



November 2008

Programmatic Environmental Impact Statement, *Designation of Energy Corridors on Federal Land in the 11 Western States* (DOE/EIS-0386)

Final
Volume II: Appendixes

Lead Federal Agencies



U.S. Department of Energy



U.S. Department of the Interior,
Bureau of Land Management

Cooperating Federal Agencies



U.S. Department of Agriculture,
Forest Service



U.S. Department of Defense



U.S. Department of the Interior,
Fish and Wildlife Service

November 2008

Programmatic Environmental Impact Statement, *Designation of Energy Corridors on Federal Land in the 11 Western States (DOE/EIS-0386)*

Final

Volume II: Appendixes

Lead Agencies

U.S. Department of Energy
U.S. Department of the Interior, Bureau of Land Management

Cooperating Agencies

U.S. Department of Agriculture, Forest Service
U.S. Department of Defense
U.S. Department of the Interior, Fish and Wildlife Service
California Energy Commission
California Public Utilities Commission
State of Wyoming
Lincoln County, Wyoming
Lincoln County Conservation District, Wyoming
Sweetwater County, Wyoming
Sweetwater County Conservation District, Wyoming
Uinta County, Wyoming
Uinta County Conservation District, Wyoming
Coeur d'Alene Tribe

This page intentionally left blank.

DOCUMENT CONTENTS

VOLUME I

- Summary
- Chapter 1: Why Are Federal Agencies Proposing to Designate Energy Corridors in the West?
- Chapter 2: What Are the Alternatives Evaluated in This PEIS?
- Chapter 3: What Are the Potential Environmental Consequences of Corridor Designation and Land Use Plan Amendment?
- Chapter 4: What Are the Cumulative Impacts of the Proposed Action?
- Chapter 5: What Unavoidable Adverse Impacts Might Be Caused by Corridor Designation and Land Use Plan Amendment?
- Chapter 6: What Is the Relationship between Local Short-Term Uses of the Environment and Long-Term Productivity?
- Chapter 7: What Irreversible and Irretrievable Commitment of Resources Would Be Involved with Implementation of the Alternatives?
- Chapter 8: List of Preparers
- Chapter 9: References
- Chapter 10: Glossary

VOLUME II

- Appendix A: Proposed Land Use Plan Amendments
- Appendix B: Summary of Public Scoping Comments for the Programmatic Environmental Impact Statement, Designation of Energy Corridors on Federal Land in the 11 Western States (DOE/EIS-0386)
- Appendix C: Tribal Consultation
- Appendix D: Distribution of the Draft PEIS
- Appendix E: Federal and State Regulatory Requirements Potentially Applicable When Designating Energy Corridors
- Appendix F: Section 368 Corridor Parameters
- Appendix G: Energy Transport Technologies and Hypothetical Energy Transport Projects
- Appendix H: Sensitive Resource Areas That Would Be Intersected by Proposed Section 368 Energy Corridors
- Appendix I: Geographic Information System Data
- Appendix J: Summary of WWEC PEIS Webcasts for Corridor Review and Revision, 6/19/06 to 7/18/08
- Appendix K: Section 368 Energy Corridor Revisions
- Appendix L: Proposed Energy Corridors That Would Require Consultation with the Department of Defense during Project Planning
- Appendix M: Federal Agency and Tribal Lands by State

- Appendix N: Potential Fossil Yield Classifications (PFYC) for Geologic Formations Intersecting Proposed Corridors under the Proposed Action by State
- Appendix O: Water Resources
- Appendix P: Floodplain/Wetland Assessment of the Effects of Energy Corridor Designation in the 11 Western States
- Appendix Q: Ecoregion Descriptions
- Appendix R: Potential Impacts of Energy Corridor Construction and Operation on Species Listed, Proposed for Listing, or Candidates for Listing under the Endangered Species Act
- Appendix S: Selected Potentially Sensitive Visual Resource Areas Intersected by or in Close Proximity to Proposed Section 368 Energy Corridors Designated under the Proposed Action
- Appendix T: Section 106 Consultation and Data Request
- Appendix U: Archaeological, Historic, and Ethnographic Context
- Appendix V: National Register of Historic Places — Listed Properties within 1 Mile of Corridor Centerlines
- Appendix W: Socioeconomic Methods and Impacts

VOLUME III

- Part 1: Large Scale Base Map Series
- Part 2: State Base Map Series
- Part 3: Visual Resource Analysis Map Series
- Part 4: ROW State Base Map Series
- Part 5: Federal Land and Resource Management Plans to Be Amended
- Part 6: Changes in Section 368 Energy Corridors between Draft and Final Versions of the PEIS

VOLUME IV

- Chapter 1: Introduction
- Chapter 2: Summary of the Major Issues Raised by Commentors on the Draft PEIS and the Agency Responses to These Issues
- Chapter 3: Summary of the Changes Made to the Draft PEIS
- Chapter 4: Responses to Comments

CONTENTS

NOTATION.....	xv
ENGLISH/METRIC AND METRIC/ENGLISH EQUIVALENTS	xix
Appendix A: Proposed Land Use Plan Amendments.....	A-1
Appendix B: Summary of Public Scoping Comments for the Programmatic Environmental Impact Statement, Designation of Energy Corridors on Federal Land in the 11 Western States (DOE/FS-0386).....	B-1
Appendix C: Tribal Consultation	C-1
C.1 Introduction.....	C-3
C.2 The Special Status of Tribes	C-3
C.3 Tribal Concerns.....	C-31
C.3.1 Energy Corridor Designation.....	C-44
C.3.2 Development within the Corridors.....	C-45
Appendix D: Distribution of the Draft PEIS	D-1
Appendix E: Federal and State Regulatory Requirements Potentially Applicable When Designating Energy Corridors	E-1
Appendix F: Section 368 Corridor Parameters	F-1
Appendix G: Energy Transport Technologies and Hypothetical Energy Transport Projects.....	G-1
G.1 Energy Transport Technologies.....	G-3
G.1.1 Electricity Transmission	G-3
G.1.2 Natural Gas Transport.....	G-4
G.1.3 Liquid Petroleum Transport.....	G-5
G.1.4 Hydrogen Transport	G-7
G.1.5 Alternative and Advanced Energy Transmission	G-9
G.2 A Hypothetical Energy Transport Project Development.....	G-14
G.2.1 What Is the Purpose of Identifying Hypothetical Energy Transport Projects?	G-14
G.2.2 What General Assumptions Does the Hypothetical Scenario Make?	G-19

CONTENTS (Cont.)

Appendix H: Sensitive Resource Areas That Would Be Intersected by Proposed Section 368 Energy Corridors.....	H-1
Appendix I: Geographic Information System Data	I-1
Appendix J: Summary of WWEC PEIS Webcasts for Corridor Review and Revision, 6/19/06 to 7/18/08	J-1
Appendix K: Section 368 Energy Corridor Revisions	K-1
Appendix L: Proposed Energy Corridors That Would Require Consultation with the Department of Defense during Project Planning	L-1
Appendix M: Federal Agency and Tribal Lands by State.....	M-1
Appendix N: Potential Fossil Yield Classifications for Geologic Formations Intersecting Proposed Corridors under the Proposed Action by State.....	N-1
Appendix O: Water Resources	O-1
Appendix P: Floodplain/Wetland Assessment of the Effects of Energy Corridor Designation in the 11 Western States.....	P-1
P.1 Introduction.....	P-3
P.2 Description of the Alternatives	P-3
P.3 Floodplains along the Designated Corridors.....	P-3
P.4 Wetlands along the Designated Corridors	P-5
P.5 Effects of the Alternatives	P-6
P.5.1 Effects of the No Action Alternative on Floodplains	P-7
P.5.2 Effects of the Proposed Action on Floodplains	P-7
P.5.3 Effects of the No Action Alternative on Wetlands	P-7
P.5.4 Effects of Corridor Designation on Wetlands.....	P-8
P.6 Conclusions.....	P-8
Appendix Q: Ecoregion Descriptions	Q-1
Appendix R: Potential Impacts of Energy Corridor Construction and Operation on Species Listed, Proposed for Listing, or Candidates for Listing under the Endangered Species Act	R-1

CONTENTS (Cont.)

R.1	Introduction.....	R-3
R.2	Potential Impacts of Energy Corridor Construction and Operation on Threatened and Endangered Species.....	R-3
Appendix S:	Selected Potentially Sensitive Visual Resource Areas Intersected by or in Close Proximity to Proposed Section 368 Energy Corridors Designated under the Proposed Action.....	S-1
Appendix T:	Section 106 Consultation and Data Request.....	T-1
Appendix U:	Archaeological, Historic, and Ethnographic Context	U-1
U.1	The Great Basin	U-3
U.1.1	Settlement Pattern	U-4
U.1.2	Prehistoric Context.....	U-5
U.1.3	Protohistoric Context	U-6
U.1.4	Historic Context.....	U-6
U.1.5	Ethnohistoric Context	U-8
U.2	The Southwest.....	U-9
U.2.1	Settlement Pattern	U-9
U.2.2	Prehistoric Context.....	U-9
U.2.3	Protohistoric Context	U-15
U.2.4	Historic Context.....	U-15
U.2.5	Ethnohistoric Context	U-17
U.3	The Great Plains.....	U-18
U.3.1	Settlement Pattern	U-19
U.3.2	Prehistoric Context.....	U-20
U.3.3	Protohistoric Context	U-21
U.3.4	Historic Context.....	U-22
U.3.5	Ethnohistoric Context	U-23
U.4	The Plateau.....	U-25
U.4.1	Settlement Pattern	U-26
U.4.2	Prehistoric Context.....	U-26
U.4.3	Protohistoric Period	U-27
U.4.4	Historic Context.....	U-28
U.4.5	Ethnohistoric Context	U-28
U.5	California	U-29
U.5.1	Settlement Pattern	U-29
U.5.2	Prehistoric Context.....	U-31
U.5.3	Protohistoric Period	U-32
U.5.4	Historic Context.....	U-32
U.5.5	Ethnohistoric Context	U-33

CONTENTS (Cont.)

	U.6 Northwest Coast.....	U-34
	U.6.1 Settlement Pattern	U-34
	U.6.2 Prehistoric Context.....	U-34
	U.6.3 Protohistoric Context	U-37
	U.6.4 Historic Context.....	U-37
	U.6.5 Ethnohistoric Context	U-38
Appendix V:	National Register of Historic Places-Listed Properties within 1 Mile of Corridor Centerlines.....	V-1
Appendix W:	Socioeconomic Methods and Impacts	W-1
W.1 How Were Potential Impacts Evaluated?		W-3
W.1.1 Corridor Energy Transport Project Data.....		W-3
W.1.2 Impacts on Employment and Income		W-3
W.1.3 Impacts on Population.....		W-4
W.1.4 Impacts on Housing Markets		W-5
W.1.5 Impacts on Community Services		W-5
W.1.6 State Taxes		W-6
W.1.7 Property Values and Quality of Life.....		W-6
W.1.8 Recreation		W-6
W.2 What Might Be the Environmental Consequences of Project Construction and Operation?.....		W-7
W.2.1 No Action Alternative.....		W-7
W.2.2 Proposed Action.....		W-8
W.2.3 Impact of Energy Transport Systems on Property Values.....		W-11
W.2.4 Recreation		W-12
W.2.5 Quality of Life.....		W-12
W.2.6 Social Impacts		W-14
W.2.7 Energy Reliability and Availability Impacts on Local Economic Development.....		W-14
W.3 Mitigation Measures		W-14

FIGURES

C-1	The Proposed Corridors in Ethnohistorically Established Tribal Territories.....	C-16
C-2	The Proposed Corridors in Judicially Established Tribal Land Claims	C-17
G-1	Possible Visual Impacts of Electricity Transmission Systems.....	G-15

FIGURES (Cont.)

G-2	Possible Impacts of Natural Gas and Liquid Product Pipelines	G-16
L-1	Proposed Energy Corridors That Would Require DOD Coordination during Project Planning	L-4
P-1	Corridors Proposed for Designation.....	P-4
Q-1	Level III Ecoregions of the 11 Western States.....	Q-4
Q-2	Level III Ecoregions of Arizona and the Proposed Energy Corridors	Q-5
Q-3	Level III Ecoregions of California and the Proposed Energy Corridors.....	Q-6
Q-4	Level III Ecoregions of Colorado and the Proposed Energy Corridors	Q-7
Q-5	Level III Ecoregions of Idaho and the Proposed Energy Corridors	Q-8
Q-6	Level III Ecoregions of Montana and the Proposed Energy Corridors.....	Q-9
Q-7	Level III Ecoregions of Nevada and the Proposed Energy Corridors.....	Q-10
Q-8	Level III Ecoregions of New Mexico and the Proposed Energy Corridors	Q-11
Q-9	Level III Ecoregions of Oregon and the Proposed Energy Corridors	Q-12
Q-10	Level III Ecoregions of Utah and the Proposed Energy Corridors	Q-13
Q-11	Level III Ecoregions of Washington and the Proposed Energy Corridors.....	Q-14
Q-12	Level III Ecoregions of Wyoming and the Proposed Energy Corridors	Q-15
U-1	Traditional Tribal Ranges in the Great Basin Cultural Area.....	U-4
U-2	Tribes of the Southwestern Cultural Area	U-10
U-3	Native Americans of the Great Plains	U-19
U-4	Tribes of the Plateau Cultural Area.....	U-25
U-5	Tribes of the California Cultural Area	U-30
U-6	Native Americans on the Northwest Coast	U-35

TABLES

A	Proposed Land Use Plan Amendments for Designating EPAct Section 368 Energy Corridors on Federal Lands in the 11 Western States	A-3
C-1	Laws, Orders, and Regulations Requiring Tribal Consultation	C-5
C-2	Ancestral Tribal Territories in Which Corridors Are Proposed.....	C-6
C-3	Tribes Contacted by State.....	C-18
C-4	Federally Recognized Tribes Requesting Consultation or Additional Information.....	C-28
C-5	Additional Tribal Officials Receiving the Draft PEIS	C-32
C-6	Public Comments Submitted by Tribes.....	C-43
E-1	Air Quality.....	E-4
E-2	Cultural Resources	E-5
E-3	Energy Projects.....	E-6
E-4	Floodplains and Wetlands	E-8
E-5	Groundwater, Drinking Water, and Water Rights.....	E-9
E-6	Hazardous Materials.....	E-11
E-7	Hazardous Waste and Polychlorinated Biphenyls.....	E-12
E-8	Land Use.....	E-13
E-9	Noise.....	E-15
E-10	Paleontological Resources.....	E-16
E-11	Pesticides and Noxious Weeds.....	E-18
E-12	Solid Waste.....	E-19
E-13	Source Water Protection.....	E-20
E-14	Water Bodies and Wastewater	E-21

TABLES (Cont.)

E-15	Vegetation and Wildlife	E-22
F	Lengths, Widths, and Compatible Energy Uses for Section 368 Corridors on Federal Lands under the Proposed Action	F-3
H	Intersections of Proposed Section 368 Energy Corridors with Sensitive Resource Areas under the Proposed Action	H-3
I	Characteristics of GIS Data Used in the WWEC PEIS	I-5
J	WWEC PEIS Webcasts for Corridor Review and Revision, 6/19/06 to 7/18/08	J-3
K-1	Changes in EPAct Section 368 Energy Corridors between Draft and Final Versions of the PEIS	K-3
K-2	Corridor Changes Requested during the Public Comment Period Which Were Considered But Not Made	K-12
L-1	Proposed Energy Corridors That Would Require DOD Coordination during Project Planning	L-5
M-1	Bureau of Land Management Lands in the 11 Western States	M-3
M-2	Forest Service Lands in the 11 Western States	M-10
M-3	National Park Service Lands in the 11 Western States	M-14
M-4	Fish and Wildlife Service Lands in the 11 Western States	M-18
M-5	Military Installations in the 11 Western States	M-25
M-6	Indian Reservations and Land Trusts in the 11 Western States as Identified by the U.S. Census Bureau	M-30
N-1	PFYC Classes by Formation for Corridors and Corridor Segments under the Proposed Action, Arizona	N-4
N-2	PFYC Classes by Formation for Corridors and Corridor Segments under the Proposed Action, California	N-6
N-3	PFYC Classes by Formation for Corridors and Corridor Segments under the Proposed Action, Colorado	N-7

TABLES (Cont.)

N-4	PFYC Classes by Formation for Corridors and Corridor Segments under the Proposed Action, Idaho	N-8
N-5	PFYC Classes by Formation for Corridors and Corridor Segments under the Proposed Action, Montana	N-9
N-6	PFYC Classes by Formation for Corridors and Corridor Segments under the Proposed Action, Nevada	N-10
N-7	PFYC Classes by Formation for Corridors and Corridor Segments under the Proposed Action, New Mexico	N-12
N-8	PFYC Classes by Formation for Corridors and Corridor Segments under the Proposed Action, Oregon	N-14
N-9	PFYC Classes by Formation for Corridors and Corridor Segments under the Proposed Action, Utah	N-17
N-10	PFYC Classes by Formation for Corridors and Corridor Segments under the Proposed Action, Washington.....	N-19
N-11	PFYC Classes by Formation for Corridors and Corridor Segments under the Proposed Action, Wyoming	N-20
N-12	Types and General Locations of Quaternary Sediments Located in the Vicinity of the Corridors and Corridor Segments under the Proposed Action, by State	N-22
O-1	Wild and Scenic Rivers by State	O-3
O-2	Designation Classification and Administration Authority for Wild and Scenic Rivers in the 11 Western States	O-10
O-3	Length of River Habitat Intersected by Section 368 Corridors under the Proposed Action and the Associated Hydrologic Landscape Regions.....	O-14
O-4	List of Congressionally Authorized Wild and Scenic Study Rivers	O-22
P-1	Wetland Area in the 11 Western States, 1980s Estimates.....	P-6
P-2	Floodplain Areas Crossed by Corridors under the Proposed Action	P-8

TABLES (Cont.)

P-3	Named Streams Intersected by Corridors under the Proposed Action.....	P-8
R	Preferred Habitat and Area of Potentially Occupied and Critical Habitat of Species Listed, Proposed for Listing, or Candidates for Listing under the Endangered Species Act in Counties That Are Crossed by Designated Corridors.....	R-5
S-1	Intersections of Proposed Section 368 Energy Corridors with Selected Sensitive Visual Resource Areas under the Proposed Action.....	S-3
S-2	Proximity Events Involving Section 368 Energy Corridors and Selected Sensitive Visual Resource Areas under the Proposed Action	S-6
V	NRHP-Listed Properties within 1 Mile of Corridor Centerlines.....	V-3
W-1	Potential Socioeconomic Impacts of Energy Transport Project Development in the Proposed Energy Corridors.....	W-9
W-2	State Economic Impacts of Reductions in Recreation Sector Activity	W-13

This page intentionally left blank.

NOTATION

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

GENERAL ACRONYMS AND ABBREVIATIONS

AC	alternating current
AD	anno Domini
AFB	Air Force Base
AIRFA	American Indian Religious Freedom Act of 1978
ANFO	ammonium nitrate/fuel oil
API	American Petroleum Institute
ARPA	Archaeological Resources Protection Act of 1979
ARS	<i>Arizona Revised Statutes</i>
ASME	American Society of Mechanical Engineers
BC	before the Christian era
BLM	Bureau of Land Management
CFR	<i>Code of Federal Regulations</i>
CO ₂	carbon dioxide
CRS	<i>Colorado Revised Statutes</i>
CWA	Clean Water Act
DC	direct current
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
E.O.	Executive Order
EPA	U.S. Environmental Protection Agency
EPAct	Energy Policy Act of 2005
ESD	emergency shutdown
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FLMPA	Federal Land Policy and Management Act of 1976
FS	Forest Service
GIS	geographical information system
HTS	high-temperature superconductivity
HVAC	high-voltage alternating current

HVDC	high-voltage direct current
IC	<i>Idaho Code</i>
ID	inside diameter
LN2	liquid nitrogen
LNG	liquefied natural gas
MCA	<i>Montana Code Annotated</i>
MTR	military training route
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NAICS	North American Industry Classification System
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act of 1976
NHPA	National Historic Preservation Act
NMSA	<i>New Mexico Statutes Annotated</i>
NPS	National Park Service
NRHP	<i>National Register of Historic Places</i>
NRS	<i>Nevada Revised Statutes</i>
OD	outer diameter
OPS	Office of Pipeline Safety (U.S. Department of Transportation)
ORS	<i>Oregon Revised Statutes</i>
PCB	polychlorinated biphenyl
PEIS	Programmatic Environmental Impact Statement
PFYC	Potential Fossil Yield Classification
P.L.	Public Law
POC	point-of-contact
RCW	<i>Revised Code of Washington</i>
ROW(s)	right(s)-of-way
SCADA	supervisory control and data acquisition
SHPO	State Historic Preservation Office
SPR	Strategic Petroleum Reserve
SUA	special use area
TAPS	Trans-Alaska Pipeline System
TUP	temporary use permit
UCR	<i>Utah Code Annotated</i>
USC	<i>United States Code</i>
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

WS *Wyoming Statutes*
WWEC West-wide energy corridor

UNITS OF MEASURE

bhp	break horsepower
bpd	barrels per day
kV	kilovolt(s)
MW	megawatt(s)
psig	pound(s) per square inch gauge

This page intentionally left blank.

ENGLISH/METRIC AND METRIC/ENGLISH EQUIVALENTS

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

Multiply	By	To Obtain
<i>English/Metric Equivalents</i>		
acres	0.4047	hectares (ha)
cubic feet (ft^3)	0.02832	cubic meters (m^3)
cubic yards (yd^3)	0.7646	cubic meters (m^3)
degrees Fahrenheit ($^{\circ}\text{F}$) – 32	0.5555	degrees Celsius ($^{\circ}\text{C}$)
feet (ft)	0.3048	meters (m)
gallons (gal)	3.785	liters (L)
gallons (gal)	0.003785	cubic meters (m^3)
inches (in.)	2.540	centimeters (cm)
miles (mi)	1.609	kilometers (km)
miles per hour (mph)	1.609	kilometers per hour (kph)
pounds (lb)	0.4536	kilograms (kg)
short tons (tons)	907.2	kilograms (kg)
short tons (tons)	0.9072	metric tons (t)
square feet (ft^2)	0.09290	square meters (m^2)
square yards (yd^2)	0.8361	square meters (m^2)
square miles (mi^2)	2.590	square kilometers (km^2)
yards (yd)	0.9144	meters (m)
<i>Metric/English Equivalents</i>		
centimeters (cm)	0.3937	inches (in.)
cubic meters (m^3)	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 ($^{\circ}\text{C}$) + 17.78	1.8	degrees Fahrenheit ($^{\circ}\text{F}$)
hectares (ha)	2.471	acres
kilograms (kg)	2.205	pounds (lb)
kilograms (kg)	0.001102	short tons (tons)
kilometers (km)	0.6214	miles (mi)
kilometers per hour (kph)	0.6214	miles per hour (mph)
liters (L)	0.2642	gallons (gal)
meters (m)	3.281	feet (ft)
meters (m)	1.094	yards (yd)
metric tons (t)	1.102	short tons (tons)
square kilometers (km^2)	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)

This page intentionally left blank.