

ADDRESSING CLIMATE CHANGE WITHOUT LEGISLATION

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VOLUME 1: DOI

How the U.S. Department of
the Interior can use its existing
legal authority to reduce
greenhouse gas emissions
and increase clean energy use



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HOW THE DEPARTMENT OF THE INTERIOR CAN USE ITS EXISTING LEGAL AUTHORITY TO REDUCE GREENHOUSE GAS EMISSIONS AND INCREASE CLEAN ENERGY USE

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June 2014

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ACKNOWLEDGEMENTS

The authors are grateful to the University of California, Berkeley Energy and Climate Institute for its generous support. We would specifically like to thank Professor Paul Wright, Director of the Berkeley Energy and Climate Institute, and Vice Chancellor for Research Graham Fleming for their commitment to this project.

We thank Steve Black, Counsel at Bingham McCutchen LLP and former Counselor to the Secretary of the Interior, for his insightful comments on this report. We also thank Professor Daniel Farber, Professor Eric Biber, Professor Holly Doremus, and Jayni Hein of the University of California Berkeley, School of Law for their helpful comments and advice. In addition, we are grateful to Danny Cullenward and Catherine Wright of the Berkeley Energy and Climate Institute for their help in the production of this document. Any errors are our own.

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Grand Canyon National Park, Arizona. Courtesy of Etienne Le Sueur.

1. INTRODUCTION

On May 6, 2014, the U.S. Global Climate Change Research Program issued its third National Climate Assessment, declaring that human-induced climate change is already affecting the American people in far-reaching ways.¹ The report talks about extreme weather events, melting glaciers, and sea level rise. It also emphasizes that the amount of future climate change will still largely be determined by choices society makes about emissions from this point forward.

Changing climatic conditions are the result of rising concentrations of carbon dioxide in the earth's atmosphere.² The National Oceanic and Atmospheric Administration estimates that global atmospheric carbon dioxide levels have increased by more than twenty percent over the

last forty years, reaching 396.48 parts per million in 2013.³ Carbon dioxide emissions primarily result from the burning of fossil fuels (i.e., coal, oil, and gas) in the energy and transportation sectors.⁴ Other large sources of carbon dioxide include manufacturing, agricultural production, and land clearing.⁵ These activities also emit methane, nitrous oxide, and other greenhouse gases.⁶

Carbon dioxide and other greenhouse gases trap heat in the earth's atmosphere, resulting in the elevation of surface temperatures. The Intergovernmental Panel on Climate Change ("IPCC") estimates that average global temperatures rose by more than 1.0°F during the 20th century and could rise a further 11.5°F by 2100.⁷ The third National Climate Assessment indicates that warming will occur across

the U.S., with temperatures forecast to increase by 2.0 to 4.0°F in most areas within just a few decades.⁸ These temperature changes will be accompanied by shifts in the amount, timing, and distribution of precipitation. Regional differences in precipitation will increase, with wet areas expected to become wetter and dry areas expected to become drier.⁹ In all areas, precipitation will increasingly be concentrated into fewer heavy downpours with longer dry periods in between.¹⁰

Changing temperature and precipitation patterns will have profound impacts on the global environment. Higher temperatures will accelerate the melting of glaciers, leading to sea levels to rises that have the potential to damage or destroy land.¹¹ Water resources will also be affected as higher temperatures reduce snow and ice cover and increase evaporation.¹² These effects will be magnified by shifts in precipitation, including prolonged droughts and flash floods that cause further declines in water quantity and quality respectively.¹³ Other extreme weather events such as hurricanes and tornados may also become more frequent and severe, placing added stress on resources.¹⁴

Reducing carbon dioxide emissions from electricity generation and other sources will slow the pace of atmospheric warming and thereby delay or avoid other climatic changes.¹⁵ Similar benefits can also be achieved through carbon sequestration, whereby carbon dioxide is diverted from emissions sources and/or removed from the atmosphere and stored in geological formations and/or terrestrial environments.¹⁶

Seeking to encourage such activities, President Obama has repeatedly called on Congress

to enact legislation providing a “market-based solution to climate change.”¹⁷ In the absence of Congressional action, the President has used existing executive powers to support climate change mitigation.

In the 2013 State of the Union Address, delivered on February 12, President Obama stated that he would take “executive actions...now and in the future, to reduce pollution, prepare our communities for the consequences of climate change, and speed the transition to more sustainable sources of energy.”¹⁸ Fulfilling this commitment, on June 25, 2013, the President issued a new Climate Action Plan directing the executive branch to, among other things, adopt climate change mitigation strategies.¹⁹ To this end, the Climate Action Plan:

- requires carbon pollution standards to be established for new and existing power plants;²⁰
- encourages the generation of electricity from wind, solar, and other renewable fuel sources;²¹
- pledges \$8 billion in loan guarantees for advanced fossil energy projects;²²
- commits to reducing energy waste and increasing energy efficiency;²³
- provides for the development of fuel economy standards for heavy-duty vehicles;²⁴
- supports research into biofuels, electric vehicles, and other low-emission transportation options;²⁵
- requires action to reduce emissions of methane;²⁶ and
- mandates the conservation and sustainable management of forests to increase carbon sequestration.²⁷

The Department of the Interior (“**DOI**”) is one of several executive agencies charged with implementing the President’s Climate Action Plan. As the federal agency responsible for overseeing development of the nation’s land, water, and mineral resources, the DOI can play an important role in mitigating climate change. The DOI manages approximately 500 million acres of land in the U.S. and a further 1.7 billion acres off its shores.²⁸ In addition, the DOI also administers 400 million acres of subsurface mineral estate,²⁹ operates 337 federal dams,³⁰ and protects more than 400 national parks³¹ and 1100 endangered species³² across the U.S.

The use of DOI-administered land for energy development, mineral extraction, and other activities currently emits greenhouse gases and limits carbon sequestration, both of which contribute to climate change. For example, the production and transportation of federal oil and gas reserves generates methane, a potent greenhouse gas with a global warming potential³³ twenty one times that of carbon dioxide over a 100 year time horizon and even greater relative impacts over shorter periods.³⁴ Moreover, these activities also result in land clearing, destroying trees and other vegetation that act as carbon sinks. This may release the carbon already stored in vegetation and decrease future storage potential.³⁵

Nevertheless, in the future, DOI resources can be used in ways that mitigate climate change. Taking an initial step in this direction, the DOI has recently sought to increase carbon sequestration in national parks and wildlife refuges to offset emissions from electricity generation and other sources.³⁶ Moreover, in an

attempt to reduce such emissions, the DOI has facilitated the development of clean energy alternatives to carbon-intensive fossil fuels. To this end, the DOI’s Bureau of Reclamation (“**Reclamation**”) has upgraded hydroelectric power plants on federal dams and associated water infrastructure, increasing annual generation by 200 gigawatt hours (“**GWh**”).³⁷ Additionally, the DOI’s Bureau of Land Management (“**BLM**”) has permitted twenty-nine solar energy projects with a total capacity of over eight gigawatts (“**GW**”) ³⁸ and thirty-nine wind energy projects with a total capacity of almost six GW on the public lands it administers (“**BLM Lands**”).³⁹ To enable the delivery of this renewable energy to load centers, BLM has supported the construction of new transmission infrastructure.⁴⁰

Building on progress to date, the President’s Climate Action Plan directs the DOI to take further steps to mitigate climate change.⁴¹ Specifically, the Climate Action Plan requires the DOI to work with the Departments of Agriculture, Energy, Labor, and Transportation and the Environmental Protection Agency to develop a strategy for limiting methane emissions from energy and other projects.⁴² Additionally, to further reduce emissions, the DOI must permit new renewable energy projects with a combined capacity of ten GW by 2020.⁴³ In the past, such projects were supported through the renewable electricity production tax credit. With the expiration of the credit on December 31, 2013,⁴⁴ other means of encouraging renewable energy development are needed.

This report identifies actions the DOI can take, on the basis of its current legal authority, to mitigate climate change. The report pro-

vides a survey of actions that can be taken under existing law, without the need for approval by Congress. The identified actions each result in reduced greenhouse gas emissions and/or increased carbon sequestration. However, beyond this finding of climate benefits, the report does not assess the merits of each action. Rather, it is left up to the DOI to determine whether implementation of each action is a wise policy choice.

Relying on its existing legal authority, the DOI could:

- **Reduce Greenhouse Gas Emissions Related to Oil and Gas.** The DOI can reduce greenhouse gas emissions from oil and gas production, transportation, and use by requiring oil and gas companies to report on the climate impacts of their operations and to take appropriate steps to minimize those impacts.
- **Use Plants and Soil to Store Carbon.** The DOI can focus its management of BLM Lands to enhance their ability to store carbon dioxide in plants and soils.
- **Use BLM Lands for Underground Carbon Sequestration.** The DOI can actively promote the use of BLM Lands for geologic carbon sequestration and storage projects and encourage the development of pilot projects.
- **Encourage the Development of More Renewable Power and More Transmission for Renewables.** The DOI can encourage more development of renewable energy facilities on BLM Lands by approving further reductions in the rents and other fees charged to renewable energy producers and preventing the speculative stockpiling of

renewable energy sites. In addition, it can work with other federal agencies to streamline the permitting process for electric transmission projects on BLM Lands.

- **Build More Hydroelectric Capacity.** The DOI could expand hydroelectric generation by investing in new or upgraded power plants on existing federal dams and other water infrastructures.
- **Increase the Use of National Parks and Monuments to Improve Public Understanding of Climate Challenges and Solutions.** The DOI can undertake additional research on the impact of climate variations on national parks and options for mitigating those impacts, and increase the use of national parks to demonstrate and point to promising solutions.
- **Reduce Greenhouse Gases to Avoid the Extinction of Animals and Plants.** The DOI can require that all future threatened and endangered species listing decisions include consideration of the impacts of climate change on individual species, and require that federal agencies consult with the U.S. Fish and Wildlife Service (“FWS”). FWS could determine that federal agency actions emitting greenhouse gases, and/or otherwise contributing to climate change, jeopardize listed species. Where such a determination is made, FWS could require that the action be modified or cancelled to avoid the jeopardy. Additionally, FWS could also enjoin non-federal actions contributing to climate change on the basis that such actions result in the taking of listed species.

2. THE U.S. DEPARTMENT OF THE INTERIOR

The DOI is a Cabinet-level agency that manages America's vast natural and cultural resources. The department employs 70,000 people, including expert scientists and resource-management professionals, in nine technical bureaus:

- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Ocean Energy Management
- Bureau of Reclamation
- Bureau of Safety and Environmental Enforcement
- National Park Service
- Office of Surface Mining, Reclamation and Enforcement
- U.S. Fish and Wildlife Service
- U.S. Geological Survey

3. THE MINERAL ESTATE

KEY POINTS

- The production, transportation, and use of oil and gas emits substantial air pollutants, including carbon dioxide, nitrogen oxides, and methane which contribute to climate change.
- The DOI has broad regulatory authority over the U.S. mineral estate. The DOI's regulatory duties include permitting the exploration and development of oil and gas resources, supervising the construction and operation of oil and gas infrastructure, and collecting rents and royalties from oil and gas companies.
- To minimize the oil and gas industry's climate impacts, the DOI could require industry participants to reduce their greenhouse gas emissions by, for example, using emissions control technologies.
- The DOI could also collect and publish information on the greenhouse gas emissions resulting from oil and gas production, transportation, and use and options for mitigating those emissions. By increasing awareness of the oil and gas industry's contribution to climate change, this may encourage more climate-sensitive decision-making both within and outside the department.

The federal government owns approximately 700 million acres of subsurface mineral resources underlying federal and non-federal lands in the U.S.⁴⁵ Additionally, the mineral resources on 1.7 billion acres of submerged land on the outer continental shelf⁴⁶ are also federally owned.⁴⁷ Through legislation, executive orders, and agency policies, the government has committed to developing these resources in a safe and responsible manner for the benefit of current and future generations.

As part of its ‘all-of-the-above’ energy strategy, the Obama Administration has supported the development of federal oil and gas resources.⁴⁸ This has contributed to a significant expansion in the domestic oil and gas industry. Research by the Energy Information Administration (“**EIA**”) indicates that domestic production of crude oil increased by 32.63% in the five years from 2008 to 2013.⁴⁹ Over the same period, domestic natural gas production rose by 15.03%.⁵⁰ As a result of these increases, the U.S. now produces enough oil and gas to supply over forty percent of the nation’s energy demand.⁵¹ Domestically produced oil and gas is used to generate electricity, as a fuel in the transportation sector, and for heating, cooking, and other industrial, commercial, and residential applications.

Developing oil and gas resources raises unique environmental challenges. Expanding development may lead to the substitution of oil or gas for coal in electricity generation reducing greenhouse gas emissions therefrom. The U.S. Environmental Protection Agency (“**EPA**”) estimates that oil-fired power plants emit twenty-

five percent less carbon dioxide per megawatt hour (“**MWh**”) of electricity generated than coal-fired power plants.⁵² Natural gas-fired systems have even greater benefits, reducing carbon dioxide emissions by fifty percent compared to coal-fired plants.⁵³

Nevertheless, these benefits may be offset by upstream greenhouse gas emissions from the extraction, processing, and transportation of oil and gas. Most of these upstream emissions involve releases of methane from leaks and venting during the production process.⁵⁴ The EPA estimates that natural gas systems⁵⁵ generated over twenty two percent of U.S. methane emissions in 2012, making them the second largest anthropogenic source of methane nationally.⁵⁶ In the same year, petroleum systems⁵⁷ were estimated to be the sixth largest source of methane nationally, accounting for almost six percent of U.S. emissions.⁵⁸ In addition, the downstream combustion of oil and gas in power plants and other applications also releases methane, nitrogen oxides, and other harmful air pollutants.⁵⁹

Given this, leaving oil and gas resources undeveloped may be the most effective means of reducing greenhouse gas emissions.⁶⁰ However, even without halting development, emissions can still be reduced through improvements in the production, transportation, and use of oil and gas. Recognizing this, numerous environmental groups have called for action to limit the oil and gas industry’s climate impacts.⁶¹

This chapter identifies actions the DOI can take to limit greenhouse gas emissions from the

production, transportation, and use of oil and gas. Section 3.1 outlines the DOI's regulatory authority over the oil and gas industry. Section 3.2 then examines ways in which the DOI can use this authority to encourage or require industry participants to reduce their climate impacts.

3.1. THE DOI'S REGULATORY JURISDICTION OVER THE OIL AND GAS INDUSTRY

Responsibility for regulating federal oil and gas reserves is shared between the DOI's BLM and Bureau of Ocean Energy Management ("BOEM"). BLM manages oil, gas, and other federally owned mineral deposits underlying public and private lands in the U.S. BOEM administers the mineral estate on the outer continental shelf.

Mineral Leasing Act, section 14 (30 U.S.C. § 223) authorizes the Secretary of the Interior to lease land for oil and gas production. The Secretary of the Interior has delegated this authority to BLM. Pursuant to this delegation, BLM is responsible for, among other things, permitting the exploration and development of federal oil, gas, and other mineral deposits, supervising the construction and operation of oil and gas wells, pipelines, and associated infrastructure, and collecting rents and royalties from oil and gas companies.

In addition to regulating onshore mining activities, the DOI also manages the mineral estate on the outer continental shelf. Outer Continental Shelf Lands Act, section 8(a)(1) (43 U.S.C. § 1337(a)(1)) authorizes the Secretary of the Interior to issue leases for the explo-

ration, development, and production of oil and gas resources on the submerged lands of the outer continental shelf. The Secretary of the Interior has delegated this authority to BOEM.

3.2. ACTIONS AVAILABLE TO THE DOI TO MINIMIZE THE CLIMATE IMPACTS OF OIL AND GAS PROJECTS

The DOI has broad regulatory authority over the oil and gas industry. Pursuant to this authority, the DOI can take a number of steps to control the industry's climate impacts. The DOI could reduce greenhouse gas emissions from oil and gas systems directly by, for example, requiring industry participants to limit methane leaks and venting from oil and gas wells, pipelines, and other infrastructure. Similar benefits could also be achieved indirectly, including by reporting on the industry's methane and other greenhouse gas emissions.

Such action is consistent with recent executive efforts to minimize the climate impacts of oil and gas production. In its Climate Action Plan, the Obama Administration committed to developing an interagency strategy to limit methane emissions from these and other activities.⁶² Fulfilling this commitment, on March 28, 2014, the Administration issued the Strategy for Reducing Methane Emissions ("**Methane Strategy**") outlining actions to help meet its goal of reducing U.S. greenhouse gas emissions by seventeen percent below 2005 levels by 2020.⁶³ And on April 15, 2014, the EPA released five technical white papers discussing major sources of emissions in the oil and gas sector and identifying techniques for mitigating those emissions.⁶⁴ The white papers focus on

technical issues associated with the adoption of mitigation techniques that target methane and volatile organic compounds.⁶⁵ The EPA will use the white papers, along with input from peer reviewers and the public, “to determine how to best pursue additional [emissions] reductions” in the oil and gas sector.⁶⁶

3.2.1. ASSESSING THE CLIMATE IMPACTS OF PROPOSED OIL AND GAS PROJECTS DURING THE PERMITTING PROCESS

When permitting oil and gas projects, the DOI’s BLM and BOEM may assess the greenhouse gas emissions and other climate change effects of such projects. This may result in BLM and BOEM taking steps to mitigate those effects, including by requiring the installation of emissions control technologies. Moreover, by increasing awareness of the oil and gas industry’s climate impacts, it may also encourage industry participants to voluntarily adopt such technologies.

Onshore oil and gas production

Mineral Leasing Act, section 14 (30 U.S.C. § 223) authorizes BLM to lease land for the production of oil and gas resources. Additionally, under Mineral Leasing Act, section 28(a) (30 U.S.C. § 185(a)), BLM may also issue rights-of-way over federal lands for oil and gas pipelines. Before issuing a lease or right-of-way, BLM must conduct an environmental assessment under the National Environmental Policy Act (“**NEPA**”) (42 U.S.C. § 4321 et seq.). As part of this assessment, BLM may collect and publish information on the greenhouse gas emissions and other climate change

effects likely to result from oil and gas production, transportation, and use.

NEPA, section 102(2)(C) (42 U.S.C. § 4332(2)(C)) requires federal agencies to prepare an Environmental Impact Statement (“**EIS**”) for all “major federal actions significantly affecting the quality of the human environment.”⁶⁷ The EIS must include an assessment of the environmental impacts of the action, including any adverse impacts that cannot be avoided and alternatives thereto. Regulations issued under NEPA (42 U.S.C. § 4321 et seq.) require agencies to “[r]igorously explore and objectively evaluate” all alternatives that are reasonable.⁶⁸ The courts have held that, in undertaking this analysis of alternatives, agencies must consider possible methods for mitigating the action’s environmental impacts.⁶⁹ The agency may require adoption of identified mitigation methods that are consistent with existing legal authority.

The NEPA environmental assessment process aims to ensure that all federal agencies consider the environmental impacts of their decisions and options for mitigating those impacts. As a result, it can and should provide a means of integrating climate change information into government decision-making. The Council on Environmental Quality (“**CEQ**”) – the federal agency charged with implementing NEPA (42 U.S.C. § 4321 et seq.) – has issued guidelines indicating that climate change is a proper subject for analysis in the EIS.⁷⁰ None of the federal courts hearing NEPA challenges have expressed any doubt as to the legality of this approach.⁷¹

BLM has recognized that activities performed or authorized by it may contribute to climate change.⁷² However, despite this, BLM's rules and regulations do not expressly require consideration of the climate impacts of such activities as part of the environmental review process.⁷³ Given this, it is perhaps unsurprising that BLM often fails to undertake a comprehensive assessment of the greenhouse gas emissions and other climate change effects likely to result from oil and gas projects.

BLM's environmental review has generally been limited to identifying the causes and effects of climate change. While recognizing that oil and gas production may contribute to climate change by emitting greenhouse gases, BLM often fails to quantify such emissions. Moreover, BLM also tends to ignore downstream emissions from the use of oil and gas in electricity generation and other applications.

There is a good argument that, in reviewing an oil and gas project under NEPA (42 U.S.C. § 4321 et seq.), BLM must consider the greenhouse gas emissions generated by the project both directly, as a result of the construction and operation of oil and gas production facilities and indirectly, as a result of the transportation and use of oil and gas produced thereby. Regulations issued under NEPA (42 U.S.C. § 4321 et seq.) require federal agencies to consider all direct, indirect, and cumulative impacts of a proposed action.⁷⁴ For the purposes of this assessment, "direct impacts" are defined as those that are caused by the action and "occur at the same time and place."⁷⁵ The requirement to consider "indirect impacts" extends the assessment to also include impacts which

"are later in time or farther removed in distance, but are still reasonably foreseeable."⁷⁶ Thus, the Supreme Court has held that an agency must consider all impacts that have a "reasonably close causal relationship" to the proposed action.⁷⁷ In determining whether such a causal relationship exists, the courts will consider the agency's responsibility for the impact.⁷⁸ Where an impact would occur regardless of the agency's action, it is outside the agency's responsibility and, as such, need not be considered under NEPA (42 U.S.C. § 4321 et seq.).⁷⁹ However, where an agency's action causes upstream or downstream impacts, those impacts must be taken into account.⁸⁰

The issuance of mineral leases by BLM enables the development of federally owned oil and gas resources. This typically leads to increased oil and gas use. Indeed, if a lease were not issued, the oil and gas resources would be unavailable for use. Consequently, the greenhouse gas emissions associated with oil and gas use are a "reasonably foreseeable" result of issuance of a lease and, as such, must be considered in environmental reviews under NEPA (42 U.S.C. § 4321 et seq.).

Various approaches can be used to estimate the greenhouse gas emissions likely to result from oil and gas use. The EPA has developed methodologies for calculating carbon dioxide, nitrogen oxide, and methane emissions associated with the combustion of fossil fuels.⁸¹ Similarly, the Department of Energy has also established tools for calculating emissions from fossil fuel combustion and other activities.⁸² CEQ has recommended that agencies use these tools to assess the impact of proposed actions

on greenhouse gas emissions in environmental reviews under NEPA (42 U.S.C. § 4321 et seq.).⁸³ Consistent with this recommendation, BLM could use these and/or other established methods for assessing the impact of oil and gas projects.

In the past, BLM has often negated greenhouse gas emissions from oil and gas projects on the basis that they represent a small proportion of global emissions and cannot be linked with any specific physical effects on the environment. By way of example, in its 2012 Environmental Assessment on the impact of oil and gas production in the Uncompahgre Basin Resource Area, BLM acknowledged that production activities may emit carbon dioxide and other greenhouse gases.⁸⁴ However, BLM found that these emissions would make only a small incremental contribution to the global greenhouse gas inventory.⁸⁵ BLM further concluded that “[t]his incremental contribution to GHG [greenhouse gases]... cannot be translated into effects on climate change globally or in the area” of production.⁸⁶

Given the large number of sources emitting greenhouse gases, any single source is unlikely to make a sizable contribution to atmospheric greenhouse gas levels.⁸⁷ However, this does not mean that such emissions can be dismissed as insignificant. Regulations issued under NEPA (42 U.S.C. § 4321 et seq.) require federal agencies to assess the significance of environmental effects in light of both their context and intensity.⁸⁸ The “intensity” of an effect refers to its severity and must be evaluated based on, among other things, whether the effect presents a risk to public health or safety

and the extent to which that risk is highly uncertain or unknown.⁸⁹

As discussed above, greenhouse gas emissions contribute to climatic changes that pose a serious risk to human health and safety, the full extent of which remains unknown.⁹⁰ Recognizing this, several prominent environmental law scholars have argued that any increase in greenhouse gas emissions may have a significant impact. For example, Elizabeth Sheargold and Smita Walavalkar have asserted that “[i]n light of the potentially catastrophic impacts of global climate change, a numerically small contribution to atmospheric concentrations of GHGs [greenhouse gases] could still be considered significant.”⁹¹

To ensure a more comprehensive assessment of the climate impacts of oil and gas projects, BLM could revise its NEPA policies to require analysis of such projects’ greenhouse gas emissions and of options for reducing those emissions. This approach is supported by CEQ. On February 18, 2010, CEQ issued a draft guidance memorandum advising federal agencies to consider climate change in environmental reviews under NEPA (42 U.S.C. § 4321 et seq.).⁹² The memorandum recommends that, when assessing a project’s environmental effects, agencies should quantify cumulative greenhouse gas emissions over the life of the project, discuss the link between emissions and climate change, and identify measures to reduce emissions.⁹³

FINDING 1

BLM could consider the climate change effects of oil and gas production, transportation, and use and options for mitigating those effects in environmental reviews.

Offshore oil and gas production

The DOI, through its BOEM, manages 1.7 billion acres of submerged land on the outer continental shelf. Under Outer Continental Shelf Lands Act, section 8(a)(1) (43 U.S.C. § 1337(a)(1)), the DOI's BOEM may issue leases for the exploration, development, and production of oil and gas on these submerged lands. Every five years, BOEM issues a schedule setting out the proposed timing, size, and location of oil and gas lease sales on the outer continental shelf ("**five-year plan**"). BOEM conducts individual lease sales in accordance with this five-year plan.

When issuing leases, BOEM must consider the environmental impacts of offshore oil and gas projects. Under Outer Continental Shelf Lands Act, section 20(a) (43 U.S.C. § 1346(a)), before holding an oil or gas lease sale, BOEM must undertake an environmental study to assess the impacts of oil and gas development on the human, marine, and coastal environments of the outer continental shelf. In addition, BOEM must also conduct an environmental review under NEPA (42 U.S.C. § 4321 et seq.).⁹⁴ Pursuant to NEPA, section 102(2)(C) (42 U.S.C. § 4332(2)(C)), BOEM prepares a programmatic or broad-scale EIS outlining the likely environmental impacts of development under its five-year plan.⁹⁵ Addi-

tional environmental reviews are conducted prior to each individual lease sale.⁹⁶ These reviews tier to, or incorporate analysis from, the programmatic assessment and contain a more detailed discussion of issues specific to the relevant lease sale.

As part of its environmental review, BOEM analyzes the likely climate impacts of offshore oil and gas projects. However, like BLM's review of onshore projects, BOEM's analysis is often cursory. In its most recent programmatic assessment – issued for the 2012-2017 leasing program – BOEM considered the likely contribution of oil and gas production on the outer continental shelf to climate change.⁹⁷ Specifically, BOEM quantified the greenhouse gas emissions resulting from the construction and operation of offshore oil and gas projects.⁹⁸ However, BOEM discounted such emissions by arguing that they represent a trivial proportion of the global greenhouse gas inventory and will therefore have little impact on global climate outcomes.⁹⁹ Moreover, BOEM completely overlooked downstream emissions from the consumption of outer continental shelf oil and gas.

To remedy the deficiencies in its environmental review process, BOEM could undertake a comprehensive analysis of offshore oil and gas projects' likely greenhouse gas emissions and other climate change effects. Where this analysis indicates that a project would likely contribute to climate change or have other adverse environmental effects, BOEM could refuse to permit that project.

Outer Continental Shelf Lands Act, section 8(a)(1) (43 U.S.C. § 1337(a)(1)) gives BOEM

discretion to issue oil and gas leases on the submerged lands of the outer continental shelf. There is a good argument that, in exercising this discretion, BOEM may refuse to issue leases on environmental grounds. Outer Continental Shelf Lands Act, section 3(3) (43 U.S.C. § 1332(3)) declares, as the policy of Congress, that the outer continental shelf “should be made available for expeditious and orderly development, subject to environmental safeguards.” Consistent with this policy, Outer Continental Shelf Lands Act, section 18(1) (43 U.S.C. § 1344) requires leasing of the outer continental shelf to be conducted in a manner that “considers...[the] environmental values of the renewable and nonrenewable resources” therein and “the potential impact of oil and gas exploration on other resource values...and the marine, coastal, and human environments.”

FINDING 2

BOEM could consider the greenhouse gas emissions resulting directly and indirectly from oil and gas projects on the outer continental shelf when issuing leases in respect of such projects.

3.2.2. MONITORING THE CLIMATE IMPACTS OF OIL AND GAS PROJECTS

With the changes proposed above, the NEPA environmental assessment process should provide the DOI with an effective mechanism for collecting and publishing information on the likely climate impacts of future oil and gas projects. As these projects are developed, the DOI

may monitor and report on their actual greenhouse gas emissions and other climate change effects. This observational data would supplement the more speculative information in the NEPA documents, providing further evidence of the climate impacts of oil and gas development and a stronger impetus for the adoption of mitigation measures.

Onshore oil and gas production

As discussed above, the Mineral Leasing Act authorizes BLM to issue leases and rights-of-way for oil and gas production and transportation. Regulations implementing the Mineral Leasing Act (30 U.S.C. § 181 et seq.) give BLM broad authority to attach stipulations to oil and gas leases.¹⁰⁰ Similarly, BLM may also impose conditions on rights-of-way for oil and gas pipelines.¹⁰¹ Under Mineral Leasing Act, section 28(h)(2)(C) (30 U.S.C. § 185(h)(2)(C)), these conditions may include requirements designed to control or prevent damage to the environment or public or private property and hazards to public health or safety.

As discussed above, oil and gas projects emit substantial methane and other greenhouse gases that, by contributing to climate change, damage the environment.¹⁰² Requiring oil and gas companies to report on their emissions may help to prevent or control this environmental damage by increasing awareness of the causes of climate change and encouraging efforts to mitigate its effects. To this end, BLM may place conditions on leases and rights of way requiring oil and gas companies to provide information on the greenhouse gas emissions resulting from their operations.

FINDING 3

BLM could require oil and gas companies to report on their methane and other greenhouse gas emissions.

Offshore oil and gas development

In addition to monitoring the climate impacts of onshore oil and gas projects, the DOI can also collect and publish information on the greenhouse gas emissions resulting from offshore oil and gas development. Outer Continental Shelf Lands Act, section 8(a)(1) (43 U.S.C. § 1337(a)(1)) authorizes the DOI's BOEM to lease the submerged lands of the outer continental shelf to enable exploration for, and development, production, and transportation of, oil and gas resources therein. Under Outer Continental Shelf Lands Act, section 20(b) (43 U.S.C. § 1346(b)), BOEM must monitor the human, marine, and coastal environments of leased areas to identify any significant environmental changes resulting from oil and gas exploration, development, production, and/or transportation. To this end, BOEM may report on the methane and other greenhouse gas emissions associated with offshore oil and gas projects.

FINDING 4

BOEM could collect and publish information on the greenhouse gas emissions resulting from oil and gas projects on the outer continental shelf.

3.2.3. LIMITING GREENHOUSE GAS EMISSIONS FROM OIL AND GAS PROJECTS

In addition to raising awareness of the oil and gas industry's climate impacts, BLM and BOEM may also take steps to mitigate those impacts. This could be achieved by requiring industry participants to reduce methane and other greenhouse gas emissions from oil and gas wells, pipelines, and associated infrastructure.

The oil and gas industry is currently the largest anthropogenic source of methane in the U.S., accounting for over thirty percent of national emissions.¹⁰³ Natural gas systems account for over eighty three percent of these emissions, with most caused by the accidental leakage or intentional venting of gas during production and transportation.¹⁰⁴ The remaining seventeen percent of industry emissions are the result of venting from oil wells, storage tanks, and processing equipment.¹⁰⁵

Onshore oil and gas production

Changes in the construction and operation of wells, pipelines, and other infrastructure can significantly reduce methane leaks from onshore oil and gas systems. Promising options include:

- employing "reduced emission" completions,¹⁰⁶ whereby gas that would otherwise be vented from wells during drilling, stimulation, and repair is captured and diverted to the collection tank, re-injected into the

well, used as an on-site fuel source, or otherwise prevented from release into the atmosphere;¹⁰⁷

- installing completion combustion devices to burn gas that would otherwise be vented during well completion;¹⁰⁸
- using plunger or artificial lift systems to bring liquids that accumulate in the bottom of oil and gas wells to the surface rather than opening wells to vent gas and unload liquids;¹⁰⁹
- substituting dry-seal systems, which use high-pressure gas as a barrier to prevent leakage, for wet-seals in centrifugal compressors¹¹⁰ or, where wet-seals are used, installing equipment to capture and route leaking gas to a collection tank, fuel system, or combustion device;¹¹¹
- limiting leakage from reciprocating compressors by replacing piston rod packing and/or using vapor recovery unit systems to capture leaking gas;¹¹²
- replacing high-bleed pneumatic controllers, that are designed to vent large amounts of gas while regulating flow and pressure in pipelines, compression stations, and storage facilities, with low-bleed or no-bleed devices;¹¹³
- adopting monitoring systems and installing leak detection equipment to identify and control fugitive gas emissions;¹¹⁴ and
- improving maintenance systems to ensure the timely replacement and repair of worn and damaged infrastructure.¹¹⁵

Financial and other barriers often prevent oil and gas companies from voluntarily investing in emission control technologies.¹¹⁶ Conse-

quently, regulation mandating their adoption may be needed. In 2009, BLM announced that it would adopt a rule (known informally as ‘On-shore Oil and Gas Order No. 9’) to reduce gas venting and flaring on federal and Indian lands.¹¹⁷ BLM committed to issuing a draft of the rule by November 2010.¹¹⁸ However, this did not occur. According to the White House Methane Strategy, issued in March 2014, BLM is expected to issue the draft rule “later this year.”¹¹⁹

Recognizing the need to better regulate these releases, in February 2014, the Colorado Air Quality Control Board adopted regulations requiring oil and gas producers to limit methane emissions.¹²⁰ Under the regulations, producers must inspect equipment at natural gas wells and compressor stations for leaks and promptly complete any needed repairs.¹²¹ Additionally, producers must also take steps to reduce natural gas venting by, for example, installing low-bleed pneumatic controllers.¹²²

BLM could adopt standards, modeled on the Colorado regulations, requiring oil and gas producers to reduce methane leaks and venting. Under Mineral Leasing Act, section 16 (30 U.S.C. § 225), leases of land containing oil and gas are “subject to the condition that the lessee will...use all reasonable precautions to prevent waste” thereof. Leaks and venting currently result in significant wastage of natural gas. Indeed, recent research suggests that up to eight percent of all natural gas produced in the U.S. is lost through leaks and venting.¹²³ To avoid this waste, BLM can require oil and gas companies to install suitable leak detection and management systems. For example, BLM

could require the use of portable analyzers, optical gas imaging cameras, and other technologies that the EPA has found to be effective in identifying leaks.¹²⁴

In addition to limiting methane emissions from the production of oil and gas, BLM may also control leaks and venting during the transportation thereof. As discussed above, under Mineral Leasing Act, section 28(a) (30 U.S.C. § 185(a)), BLM may issue rights-of-way for oil and gas pipelines on federal lands. Mineral Leasing Act, section 28(f) (30 U.S.C. § 185(f)) gives BLM broad authority to impose “terms and conditions...regarding extent, duration, survey, location, construction, operation, maintenance, use, and termination” on rights-of-way. Pursuant to this authority, BLM may require oil and gas companies to take appropriate steps to reduce methane leaks and venting from pipelines.

FINDING 5

BLM could require oil and gas companies to install appropriate emissions control technologies to reduce methane leaks and venting from pipelines and other infrastructure.

Offshore oil and gas development

The DOI’s BOEM has broad authority to control methane emissions from offshore oil and gas operations. Outer Continental Shelf Lands Act, section 4(a)(1) (43 U.S.C. § 1333(a)(1)) authorizes the DOI to regulate installations and other devices permanently or temporarily attached to the seabed of the outer continental shelf to enable resource exploration, development, production, and/or trans-

portation. Under Outer Continental Shelf Lands Act, section 21(b) (43 U.S.C. § 1347(b)), in exercising this authority, the Secretary of the Interior must require all new drilling and production operations and, where practicable, existing operations to use “the best available and safest technologies which the Secretary determines to be economically feasible, whenever failure of equipment would have a significant effect on safety, health, or the environment.”

Recent research suggests that methane emissions from offshore oil and gas production can be reduced by up to eighty five percent using cost effective emissions controls, including by:

- replacing centrifugal compressor wet seals with dry seal systems, which use high-pressure gas as a barrier to prevent leakage from compressors;
- installing vapor recovery systems to capture gas vented from processing plants and storage tanks; and
- implementing leak detection and management programs to identify and control fugitive gas emissions.¹²⁵

Failing to implement these controls on offshore oil and gas systems increases methane emissions by up to eighty-five percent, accelerating global climate change. To minimize these impacts, BOEM may require new and existing oil and gas operations to implement emissions control technologies. The emissions controls discussed above have been found to be economically feasible¹²⁶ and therefore meet the requirements for adoption under Outer Conti-

mental Shelf Lands Act, section 21(b) (43 U.S.C. § 1347(b)).

FINDING 6

BOEM could require oil and gas companies to adopt suitable emissions control and other technologies to reduce fugitive methane emissions from offshore oil and gas projects.

4. BLM LANDS

KEY POINTS

- BLM Lands can play an important role in mitigating climate change. By facilitating the transition to a clean energy economy, BLM Lands can help to limit carbon dioxide and other greenhouse gas emissions. Additionally, BLM Lands can also act as carbon sinks, removing carbon dioxide from the atmosphere and storing it in terrestrial environments and geological formations.
- The DOI, through its BLM, manages approximately 247 million acres of land. BLM may permit the use of this land for energy, transportation, agriculture, recreation, and other purposes.
- The DOI has been highly successful in encouraging renewable energy development on BLM Lands. The DOI has permitted twenty-nine solar and thirty-nine wind energy projects, with a total approved capacity of almost fourteen GW. The DOI has also issued over 800 geothermal leases, fifty-nine of which are currently in producing status with a total capacity of over 1.5 GW.
- Building on this success, the President's Climate Action Plan requires the DOI to permit an additional ten GW of new renewable energy projects by 2020. The DOI may support such projects by further reducing the rents and other fees charged to clean energy developers and/or preventing the stockpiling of clean energy sites for speculation.
- The DOI can encourage the timely permitting of transmission infrastructure expansions needed to serve renewable generators by coordinating with other federal agencies with jurisdiction over these projects to streamline the permitting process.
- To ensure that the construction and operation of new transmission infrastructure does not contribute to climate change, the DOI could collect and publish information on the greenhouse gas emissions resulting from such activities, and identify options for reducing those emissions.
- In addition to providing a source of clean energy, BLM Lands can also be used to store carbon dioxide emitted by fossil-fuel power plants and other sources. The DOI can manage BLM Lands so as to increase terrestrial carbon sequestration thereon. Additionally, the DOI may also allow private parties to undertake geological carbon sequestration on BLM Lands.

BLM Lands can play an important role in mitigating climate change. Specifically, BLM Lands may help to reduce greenhouse gas emissions by facilitating the transition to a clean energy economy.

Research by the EPA indicates that electricity generation was the largest source of greenhouse gas emissions in the U.S. in 2012, accounting for over thirty percent of the national greenhouse gas inventory.¹²⁷ These emissions result from the use of carbon-intensive fossil fuels, including coal, oil, and gas, in electricity generation.¹²⁸ Replacing fossil fuel power plants with cleaner renewable power systems can substantially reduce the electricity industry's greenhouse gas emissions. The Intergovernmental Panel on Climate Change ("**IPCC**") estimates that lifecycle greenhouse gas emissions from renewable systems are ninety to ninety-five percent lower than lifecycle emissions from fossil fuel plants.¹²⁹

Significant renewable energy potential exists on BLM Lands. The DOI estimates that approximately twenty million acres of BLM Land have wind energy potential,¹³⁰ twenty three million acres have solar energy potential,¹³¹ and 111 million acres have geothermal energy potential.¹³² Moreover, BLM Lands also provide corridors for new electricity transmission infrastructure that can deliver renewable energy to load centers.¹³³

Developing renewable generating facilities is not a perfect solution to climate change. While renewable power systems generate electricity without emitting greenhouse gases or other air pollutants, the production and instal-

lation of such systems may do so.¹³⁴ In addition, these activities can also have other adverse environmental effects. For example, solar energy installations often require the clearing of large amounts of land and, as such, may damage or destroy wildlife habitat.¹³⁵ Wind farms can also negatively impact wildlife, with high rates of bird and bat mortality reported at some sites.¹³⁶ Nevertheless, renewable power systems typically cause less environmental damage than fossil fuel power plants.¹³⁷

Recognizing this, both the legislature and the executive have expressed strong support for renewable energy development on BLM and other federally-owned land. Section 211 of the Energy Policy Act of 2005 directed the DOI to permit ten gigawatts of non-hydropower renewable energy projects by 2015. In the 2012 State of the Union Address, President Obama set a more ambitious goal requiring completion of the permitting by the end of that year.¹³⁸ The DOI achieved this goal three months ahead of schedule, in October 2012.¹³⁹

Consistent with the legislative and executive policy, in March 2009, then-Secretary of the Interior Ken Salazar issued Secretarial Order 3285 identifying the production and delivery of renewable energy as one of the department's highest priorities.¹⁴⁰ To encourage such activities, the President has directed the DOI and other executive agencies to improve the permitting of renewable generating facilities and associated transmission infrastructure.¹⁴¹ Consistent with this direction, the DOI has provided 'fast track' approval for promising renewable energy projects and allocated addi-

tional staff and resources to complete environmental reviews of, and issue permits for, such projects.¹⁴² To further expedite the approvals process, the DOI has completed programmatic EISs for wind,¹⁴³ solar,¹⁴⁴ and geothermal¹⁴⁵ energy development. The analysis from these programmatic EISs can be used in evaluating individual projects, significantly reducing the time required to complete environmental reviews.¹⁴⁶ The DOI has also reduced permitting times by increasing staff in key areas. For example, the DOI has tripled the number of employees involved in processing permits for wind and solar energy projects.¹⁴⁷

These reforms have encouraged the siting of renewable generating facilities and associated transmission infrastructure on BLM Lands. No solar energy development had been authorized on BLM Lands before 2009.¹⁴⁸ Prior to this time, the DOI had authorized the production of just 556 megawatts (“**MW**”) of wind and 942 MW of geothermal energy on BLM Lands.¹⁴⁹ Since 2009, the DOI has permitted twenty-nine solar energy projects with a combined capacity of 8,586 MW, eleven wind energy projects with a combined capacity of 4,767 MW, and twelve geothermal projects with a combined capacity of 605 MW.¹⁵⁰ Additionally, over this period, the DOI has also enabled the construction of more than 1650 miles of transmission infrastructure.¹⁵¹

Renewable energy development on BLM Lands helps to mitigate climate change by avoiding the emission of carbon dioxide and other greenhouse gases in electricity generation. Where emissions cannot be avoided, they may be captured and stored on BLM Lands.

Through the process of carbon sequestration, carbon dioxide is diverted from emissions sources or removed from the atmosphere and stored in terrestrial environments and/or geological formations. Research by the U.S. Geological Survey indicates that terrestrial ecosystems on land managed by the DOI could store over six billion tons of carbon dioxide.¹⁵² Significant carbon can also be stored in geological formations underlying such land.¹⁵³

This chapter outlines actions the DOI can take to support climate change mitigation on BLM Lands. The DOI’s regulatory authority with respect to BLM Lands is summarized in section 4.1 below. Section 4.2 then discusses ways in which BLM Lands can be used to reduce greenhouse gas emissions and/or increase carbon sequestration.

4.1. THE DOI’S REGULATORY JURISDICTION OVER BLM LANDS

The DOI, through its BLM, administers approximately 247 million acres of land across the U.S.¹⁵⁴ The Federal Land Policy and Management Act (43 U.S.C. § 1701 et seq.) authorizes BLM to permit the development of this land for energy, transportation, agriculture, recreation, and other purposes.

Under Federal Land Policy and Management Act, section 501(a)(4) (43 U.S.C. § 1761(a)(4)), BLM Lands may be used for generating, transmitting, and distributing electricity. BLM reviews and approves permits for the development of both conventional and renewable energy sources on such lands. BLM has broad regulatory authority over permitted developments, including authority to supervise

the construction and operation of energy facilities and collect rents and other fees from energy companies.

4.2. ACTIONS AVAILABLE TO THE DOI TO MITIGATE CLIMATE CHANGE

The DOI is uniquely placed to support climate change mitigation. By facilitating the use of renewable energy sources, the DOI may contribute to a reduction in greenhouse gas emissions. As discussed above, BLM Lands contain significant wind, solar, and other renewable resources. The DOI can support the development of these resources by reducing the fees developers must pay to use BLM Lands and preventing the speculative stockpiling thereof. By reducing the monetary and other costs faced by developers, this may encourage increased investment in renewable energy projects. To ensure that such projects can connect to the electric grid, the DOI could streamline the permitting process for transmission infrastructure on BLM Lands.

BLM Lands can also be used to store carbon dioxide removed from the atmosphere and/or diverted from emissions sources. The DOI can support such use directly by, for example, managing BLM Lands so as to increase terrestrial carbon sequestration thereon. Similar benefits may also be achieved through more indirect channels, including by identifying BLM Lands that can be used by third parties for geological carbon sequestration.

4.2.1. SUPPORTING RENEWABLE ENERGY DEVELOPMENT ON BLM LANDS

Significant progress has already been made in developing BLM Lands' renewable resources.

The DOI has encouraged such development by prioritizing renewable energy projects on BLM Lands and improving its procedures for reviewing such projects. Building on progress to date, the DOI could further promote renewable energy development by lowering the rents and other fees developers must pay to use BLM Lands.

Wind and solar energy projects

Under Federal Land Policy and Management Act, section 501(a)(4) (43 U.S.C. § 1761(a)(4)), the DOI's BLM may grant rights-of-way on, over, or under BLM Lands for electric generating systems. Federal Land Policy and Management Act, section 504(g) (43 U.S.C. § 1764(g)) requires the holder of a right-of-way to pay rent equal to the fair market value of the land.

In June 2010, BLM announced rental rates for solar energy projects on BLM Lands ("**solar rental policy**").¹⁵⁵ Under the solar rental policy, the holder of a right-of-way for a solar energy project must pay a "base rent" for the acreage of BLM Land covered thereby.¹⁵⁶ The base rent for 2014 ranges from \$16.92 per acre to \$6,768.60 per acre, depending on the average rural land value in the county.¹⁵⁷ In addition to this base rent, the right-of-way holder must also pay an additional "megawatt capacity charge" based on the size of the project.¹⁵⁸ The charge is \$5,256 per MW for photovoltaic ("**PV**") projects, \$6,570 for concentrated PV and concentrated solar power ("**CSP**") projects without storage, and \$7884 for CSP projects with at least three hours storage capacity.¹⁵⁹

In developing the solar rental policy, BLM was mindful of the need to promote renewable energy development.¹⁶⁰ At the same time, BLM sought to ensure a fair return to taxpayers for the use of federally-owned land for such development.¹⁶¹ BLM worked hard to establish rents that appropriately balance these competing objectives, reviewing submissions from a range of interested parties and analyzing economic models on the impact of different rental rates.¹⁶² BLM is authorized to review and adjust rents to ensure that they remain appropriate over time.¹⁶³ Where BLM determines that rental rates are discouraging investment in renewable energy projects, it may reduce those rates.

Under Federal Land Policy and Management Act, section 504(g), BLM may reduce or waive the rent payable under a right-of-way where the holder “provides without or at reduced charges a valuable benefit to the public.” In such cases, the holder is required to pay such lesser charge as BLM “finds equitable and in the public interest.”

Our research has not identified any relevant administrative decisions or court cases analyzing BLM’s authority to provide rent relief to wind and solar energy developers. However, previous decisions interpreting the public benefit criterion in the Federal Land Policy and Management Act provide useful guidance on this issue. Relevantly, BLM has held that enhancement of the environment is a “valuable benefit to the public” which may justify a rent reduction.¹⁶⁴

Wind and solar energy projects displace fossil fuel power plants, reducing greenhouse

gas emissions and thereby mitigating global climate change. According to the EPA, fossil fuel power plants emit between 0.57 and 1.12 tons of carbon dioxide per MWh of electricity generated.¹⁶⁵ It is estimated that each ton of carbon dioxide produced by electricity generation and other activities causes climate damage equal to \$21 today, rising to \$45 by 2050.¹⁶⁶ As wind and solar energy projects generate electricity without releasing carbon dioxide (and with lower life-cycle emissions), their use avoids these societal costs. These costs take the form of externalities – impacts that are felt by third parties or the public at large – and are therefore not reflected in electricity prices.¹⁶⁷ In these circumstances, BLM may validly conclude that renewable energy developers provide a valuable benefit to the public without charge.

FINDING 7

BLM could reduce the rents payable for the use of BLM Lands for wind and solar energy projects.

Geothermal energy projects

In addition to regulating wind and solar energy projects, the DOI’s BLM also supervises the development of geothermal resources. Geothermal Steam Act, section 3 (30 U.S.C. § 1002) authorizes the Secretary of the Interior to issue leases for the development and utilization of geothermal resources (“**geothermal leases**”) on any lands administered by the DOI or the Department of Agriculture’s Forest Service. Under Geothermal Steam Act, section 5(a) (30 U.S.C. § 1004(a)), the lessee must

pay rent for, and royalties on, the geothermal resources.

Geothermal Steam Act, section 5(a)(3) (30 U.S.C. § 1004(a)(3)) requires lessees to make annual rent payments based on the size of the geothermal lease. For leases acquired in a competitive lease sale, the annual rent is ordinarily set at \$2 per acre for the first year and \$3 per acre for the second through tenth years.¹⁶⁸ For leases acquired non-competitively, the annual rent is \$1 per acre for the first ten years.¹⁶⁹ Thereafter, the annual rent for both types of leases is \$5 per acre.¹⁷⁰

Under Geothermal Steam Act, section 5(a)(1) (30 U.S.C. § 1004(a)(1)), lessees must also pay a royalty on electricity produced using the geothermal resources covered by the lease. The royalty rate is currently set at 1.75% of gross sales for the first ten years of production and 3.5% thereafter.¹⁷¹ Where the lessee sells geothermal resources to a third party for use in electricity generation, that sale is subject to a royalty rate of ten percent.¹⁷²

Under Geothermal Steam Act, section 13 (30 U.S.C. § 1012), the Secretary of the Interior may reduce or waive rental or royalty payments “in the interests of conservation and to encourage the greatest ultimate recovery of geothermal resources, if he determines that this is necessary to promote development.” Despite recent efforts to increase renewable generation, and despite the great appeal of geothermal power as a dispatchable resource, geothermal development has been relatively slow in recent years.¹⁷³ Between 2007 and 2012, electricity generation from geothermal resources increased by just 5.95%, while wind

and solar generation increased by 75.54% and 90.91% respectively.¹⁷⁴ Geothermal’s share of total U.S. generation in 2012 was just 0.38%, an increase of less than 0.05% over five years.¹⁷⁵

Research by the EIA indicates that recent geothermal projects have been hampered by the high costs, long lead times, and significant risks associated with resource exploration and production. In these circumstances, the Geothermal Energy Association has argued that financial incentives will be “critical” to support the future development of geothermal resources.¹⁷⁶ To this end, BLM may reduce rents and/or royalties for geothermal development.

FINDING 8

BLM could reduce the rents and/or royalties payable for the use of geothermal resources.

3.2.2. PREVENTING THE STOCKPILING OF RENEWABLE ENERGY SITES

Federal Land Policy and Management Act, section 501(a)(4) (43 U.S.C. § 1761(a)(4)) authorizes BLM to grant rights-of-way for electric generating systems on BLM Lands. Regulations issued under the Act provide for the issuance of rights-of-way on a non-competitive basis, with BLM processing applications in the order that they are received.¹⁷⁷ Under the regulations, rights-of-way can only be issued through a competitive bidding process if BLM determines that there are two or more competing applications for the same facility or system.¹⁷⁸

BLM’s policy of issuing rights-of-way on a ‘first come, first served’ basis may encourage

the stockpiling of clean energy sites by speculators who have no intention of directly developing renewable energy projects. Such speculative activity could increase the costs faced by legitimate developers and thereby hinder the use of renewable resources. Recognizing this, on December 29, 2011, BLM issued an Advance Notice of Proposed Rulemaking proposing to adopt a competitive process for leasing land for wind and solar energy projects in designated areas.¹⁷⁹ BLM subsequently announced that it would develop rules to establish this competitive process.¹⁸⁰ However, these rules have not yet been issued.

Prior to completion of the rulemaking process, BLM has relied on its existing regulations to hold competitive auctions for rights-of-way for large solar energy projects in certain areas.¹⁸¹ BLM's Western Solar Energy Plan, issued in February 2012, establishes a framework for permitting utility-scale solar energy projects in Arizona, California, Colorado, Nevada, New Mexico, and Utah.¹⁸² The plan identifies locations, described as "solar energy zones", that are well suited to utility-scale production of solar energy.¹⁸³ BLM is currently issuing rights-of-way in these zones under interim procedures which provide for the use of competitive auctions.¹⁸⁴ Under the interim procedures, on receiving an application for a right-of-way in a solar energy zone, BLM must publish a notice seeking expressions of interest in development in that zone.¹⁸⁵ Interested parties may apply for a right-of-way for solar energy facilities in the zone.¹⁸⁶ Where BLM receives two or more competing applications, it

may issue rights-of-way through a competitive bidding process.¹⁸⁷

The interim procedures should help to limit the stockpiling of solar energy sites by giving legitimate developers an opportunity to compete with speculators for rights-of-way thereon. However, the interim procedures do not apply to wind energy sites which continue to be leased on a non-competitive basis. Moreover, even where the interim rules are available, they do not eliminate the need for final rules providing for the competitive issuance of rights-of-way. BLM's delay in issuing the final rules is likely to have created significant uncertainty for solar energy developers who do not know how long the interim procedures will remain in force and/or what they will be replaced with. To remedy these problems, BLM should finalize its rulemaking as soon as possible.

FINDING 9

BLM could require all wind and solar energy sites on BLM Lands to be leased through a competitive bidding process.

4.2.2. EXPANDING TRANSMISSION INFRASTRUCTURE TO SERVE RENEWABLE ENERGY PROJECTS

New transmission infrastructure will be needed to deliver the electricity generated by renewable power systems to load centers. Many of the most useful renewable energy sources are situated in remote locations.¹⁸⁸ Unlike fossil fuels, which can be transported to where they are needed, renewable resources must be used in situ.¹⁸⁹ As a result, transmission lines are required to connect areas with high renewable

energy potential to large urban areas where power is needed.¹⁹⁰ The North American Electric Reliability Corporation estimates that supplying just fifteen percent of national electricity demand from renewable resources will require an additional 40,000 miles of transmission.¹⁹¹

Recognizing this, the federal government has taken steps to encourage the development of new transmission infrastructure. In March 2012, then-Secretary of Energy Steven Chu directed the Power Marketing Administrations to modernize their transmission grids to, among other things, enable the integration of variable renewable energy sources.¹⁹² The Department of Energy has also worked with the DOI and other agencies to expedite the permitting of transmission projects needed to deliver renewable energy.

Transmission projects are subject to review by multiple federal agencies. Delays in securing the necessary reviews increase project costs and thereby threaten project competition. To minimize the risk of delays, the DOI has partnered with other federal agencies to streamline the approvals process for transmission projects crossing BLM and other federally-owned lands.

Section 1221(h)(7)(B) of the Energy Policy Act of 2005 (16 U.S.C. § 824p(h)(7)(B)) requires federal agencies with authority over transmission facilities to enter into a memorandum of understanding (“**MOU**”) for the timely and coordinated review of proposed facilities. Pursuant to this section, on October 23, 2009, a MOU was executed between the Departments of Agriculture, Commerce, Defense, Energy, and the Interior, the Environmental Protection Agency, the Federal Energy Regulatory

Commission, the Council on Environmental Quality, and the Advisory Council on Historic Preservation (together the “**federal permitting agencies**”).¹⁹³ The MOU aims to simplify the permitting of transmission projects crossing federally managed lands in the U.S.¹⁹⁴ To this end, the MOU establishes a single federal point-of-contact to work with project proponents, facilitates preparation of unified environmental documentation to serve as the basis of federal decisions, and coordinates the federal agency reviews necessary for project development.¹⁹⁵

Building on the cooperation developed through the 2009 MOU, the federal permitting agencies have formed a Rapid Response Team for Transmission (“**RRTT**”) to further streamline the review of transmission projects.¹⁹⁶ The RRTT is initially focusing on seven pilot projects involving the construction of approximately 3,100 miles of transmission lines in Arizona, Colorado, Idaho, Minnesota, Nevada, New Jersey, New Mexico, Oregon, Pennsylvania, Utah, Wisconsin and Wyoming.¹⁹⁷ The RRTT will identify the federal agencies with authority over each project, designate a lead agency to coordinate federal review of the project, and establish a timeline for federal action on the project.¹⁹⁸

The DOI has also worked with other executive departments to prioritize transmission development in key areas. The 2005 Energy Policy Act requires the Departments of Agriculture, Commerce, Defense, Energy, and the Interior to expedite the permitting of electricity transmission facilities in areas designated as “energy corridors”. Energy Policy Act, section

368(a)-(b) (42 U.S.C. § 15926(a)-(b)) directed the Secretaries of Agriculture, Commerce, Defense, Energy, and the Interior to designate energy corridors for electricity transmission¹⁹⁹ on federal land in Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming (together the “**western states**”) by August 8, 2007 and in other states by August 8, 2009. Under Energy Policy Act, section 368(c) (42 U.S.C. § 1926(c)), the Secretaries must designate additional energy corridors as necessary.

In January 2009, the DOI designated approximately 5,000 miles of BLM-administered lands in the western states as energy corridors.²⁰⁰ Building on this work, the DOI could establish additional energy corridors in areas in which new or expanded transmission facilities are needed to serve renewable generators.

Under Energy Policy Act, section 368(d) (42 U.S.C. § 15926(d)), when designating energy corridors, the Secretaries of Agriculture, Commerce, Defense, Energy, and the Interior must assess the need for upgraded and new electricity transmission facilities to improve reliability, relieve congestion, and enhance the grid’s capacity to deliver electricity. Expanding transmission infrastructure to serve renewable generators is likely to improve electric system reliability by diversifying the generation mix. A recent study of wind power use in the eastern U.S. for the Renewable Energy Laboratory found that increasing renewable generation “can contribute to system adequacy and additional transmission can enhance that contribution.”²⁰¹ As a result, the DOI may designate

areas in which transmission expansions are required to serve renewable generators as “energy corridors” under Energy Policy Act, section 368 (42 U.S.C. § 15926). Applications to construct transmission infrastructure in these areas would then be entitled to expedited processing.²⁰²

FINDING 10

The DOI, in cooperation with the Departments of Agriculture, Commerce, Defense, and Energy, could designate areas in which new transmission facilities are needed to serve renewable generators as “energy corridors” under Energy Policy Act, section 368 (42 U.S.C. § 15926).

4.2.3. MINIMIZING THE CLIMATE IMPACTS OF TRANSMISSION PROJECTS ON BLM LANDS

The construction and operation of transmission infrastructure can have significant climate and other environmental effects. The use of fossil fuel-powered equipment and vehicles during the construction process generates carbon dioxide and other greenhouse gases. Moreover, land clearing in the construction area destroys vegetation that would otherwise act as carbon sinks, removing carbon dioxide from the atmosphere. In the longer-term, the operation of new or expanded transmission infrastructure may reduce grid congestion, leading to greater use of fossil fuel based electricity and thereby further increasing atmospheric greenhouse gas levels.

There are several actions BLM can take, pursuant to its existing legal authority, to minimize the climate impacts of transmission

development on BLM Lands. This may be achieved directly by, for example, requiring transmission developers to avoid using fossil fuel powered equipment during the construction process, replace carbon sinks destroyed to facilitate the lines, or require mitigation if the line may be used to increased consumption of fossil fuels for electric generation. Similar benefits may also be achieved indirectly, including by collecting and publishing information on the greenhouse gas emissions resulting from the construction and operation of transmission infrastructure.

The use of BLM Lands is regulated under resource management plans.²⁰³ Federal Land Policy and Management Act, section 202(a) (42 U.S.C. § 1712(a)) requires the Secretary of the Interior to develop resource management plans for all land within the Department's jurisdiction. These plans identify the land that is subject to leasing by BLM.²⁰⁴ Private parties may use the identified land pursuant to a permit issued by BLM under the Federal Land Policy and Management Act (42 U.S.C. § 1701 et seq.) or another statute.

Before adopting a resource management plan, or issuing a permit, BLM must conduct an environmental assessment under NEPA (42 U.S.C. § 4321 et seq.). As part of this assessment, BLM can analyze the greenhouse gas emissions and other climate change effects of transmission construction and options for mitigating those effects.

As discussed in Chapter 3, NEPA, section 102(2) (42 U.S.C. § 4332(2)) requires federal agencies to prepare an EIS for all "major federal actions significantly affecting the quality of

the human environment."²⁰⁵ BLM's NEPA analysis typically involves two stages or tiers. First, before revising a resource management plan(s) to allow a certain category of development (e.g., transmission construction), BLM undertakes a programmatic assessment of the potential environmental impacts of such development. Second, BLM also conducts a more specific environmental review of individual projects before issuing a right of way or other permit therefor.

BLM's rules and regulations do not currently require consideration of the greenhouse gas emissions and other climate change effects of transmission construction as part of the NEPA environmental assessment process. Given this, it is perhaps unsurprising that BLM's EIS for transmission projects have tended to overlook such effects. For example, the 2008 programmatic EIS issued in connection with the designation of energy corridors in the western states noted that climate change may affect environmental conditions within the corridors.²⁰⁶ However, the EIS did not assess the extent to which transmission construction in those areas may contribute to climate change by, for example, emitting greenhouse gases and/or destroying carbon sinks. To remedy this deficiency, BLM could revise its NEPA policies to require both programmatic and project-specific EIS to include an assessment of the climate impacts of transmission construction and of options for mitigating those impacts.

FINDING 11

BLM could consider the greenhouse gas emissions and other climate change effects of transmission projects and options for mitigating those effects in environmental reviews.

Where possible, BLM should take steps to minimize the climate effects of constructing and operating transmission infrastructure. To this end, BLM may require transmission companies to reduce their greenhouse gas emissions by, for example, avoiding the use of fossil fuel-powered equipment and vehicles during the construction process and/or replacing trees and other natural carbon sinks destroyed by construction activities.

As discussed above, under Federal Land Policy and Management Act, section 501(a)(4) (43 U.S.C. § 1761(a)(4)), BLM may grant rights of way for the construction of transmission facilities on BLM Lands. Federal Land Policy and Management Act, section 505(a)(ii) (43 U.S.C. § 1765(a)(ii)) gives BLM broad authority to impose terms and conditions on rights-of-way to “minimize damage to scenic and esthetic values and fish and wildlife habitat and otherwise protect the environment.” Under Federal Land Policy and Management Act, section 504(c) (43 U.S.C. § 1761(c)), these terms and conditions may regulate construction activities on BLM Lands. Therefore, BLM could, as a condition of rights-of-way, require transmission developers to take appropriate steps to avoid climate and other environmental damage during the construction and operation of the project.

FINDING 12

BLM could impose conditions on rights-of-way for transmission projects requiring project developers to minimize the greenhouse gas emissions and other climate change effects of development.

4.2.4. INCREASING TERRESTRIAL CARBON SEQUESTRATION ON BLM LANDS

Recent efforts to mitigate climate change have primarily focused on limiting carbon dioxide emissions from electricity generation and other sources. An alternative mitigation strategy is to remove carbon dioxide from the atmosphere. Through the process of terrestrial carbon sequestration, carbon dioxide is taken up by trees and other plants during photosynthesis and stored in biomass and soils.²⁰⁷

The rate of terrestrial carbon sequestration varies geographically, due to differences in climate patterns, vegetative covers, and soil properties.²⁰⁸ In general, wetlands have the highest average storage rate at 306 tons per acre, followed by forests (119 tons per acre), grasslands (108 tons per acre), tundra (60 tons per acre), and deserts (20 tons per acre).²⁰⁹

Sequestration rates on each type of land differ depending on the management thereof.²¹⁰ For example, the practices adopted by forest managers in establishing, maintaining, and harvesting trees have a significant impact on their ability to sequester carbon.²¹¹ Deforestation – the removal of trees through logging and other activities – may release the carbon already stored in forests and decrease future storage potential.²¹² Conversely, expanding forest cover can increase carbon stor-

age.²¹³ Similar benefits can also be achieved by improving forest health. Research suggests that thinning – removing trees to reduce competition for space, light, and nutrients²¹⁴ – can accelerate growth and thereby increase sequestration in young dense stands.²¹⁵ Moreover, it may also have other climate benefits. For example, thinning can lessen the risk of catastrophic wildfires that generate substantial carbon dioxide emissions.²¹⁶ Similarly, it may also reduce emissions from man-made sources. The woody biomass removed during thinning can be used in place of fossil fuels in electricity generation and other applications.²¹⁷ Woody biomass has a “closed carbon cycle,” meaning that the carbon dioxide released when it is burned is recaptured by new biomass growing in its place.²¹⁸

The DOI, through its land management decisions, can promote carbon sequestration. Research by the U.S. Geological Survey indicates that approximately 3.84 billion tons of carbon is currently stored in soils on land managed by the DOI.²¹⁹ Biomass on DOI-managed land currently stores an additional 0.89 billion tons of carbon.²²⁰ With improvements in land management, biomass carbon storage could increase by between 0.93 and 1.37 billion tons.²²¹ This would offset the equivalent of up to nineteen percent of annual greenhouse gas emissions in the U.S.²²²

Recognizing this, the DOI has recently sought to promote terrestrial carbon sequestration. To this end, the DOI’s National Park Service (“**NPS**”) has protected existing trees and encouraged new tree growth in national parks to maintain and increase their ability to

store carbon.²²³ For the same purpose, FWS has planted additional tree cover on national wildlife refuges.²²⁴ BLM could take similar steps to enhance carbon sequestration on BLM Lands.

Federal Land Policy and Management Act, section 101(a)(8) (43 U.S.C. § 1701(a)(8)) requires BLM Lands to be managed so as to, among other things, protect the quality of air, water, and other environmental values. Increasing carbon sequestration on BLM Lands achieves this goal.

In *Massachusetts v. Environmental Protection Agency*, 549 U.S. 497 (2007), the U.S. Supreme Court held that carbon dioxide is an “air pollutant” subject to regulation under the Clean Air Act (42 U.S.C. § 7401 et seq.). Given that the Clean Air Act (42 U.S.C. § 7401 et seq.) is intended to protect and enhance the quality of air resources,²²⁵ this finding strongly suggests that carbon dioxide negatively impacts air quality. Terrestrial carbon sequestration avoids these negative impacts by removing carbon dioxide from the atmosphere. Moreover, by mitigating climate change, it also protects other environmental values. The rising temperatures associated with climate change will increase evaporation, leading to a decline in water supplies in many areas.²²⁶ Water resources will also be impacted by droughts, floods and other extreme weather events.²²⁷ This will not only reduce water quantity and quality, but also adversely affect other resources and values including fish and wildlife, scenic views, and recreational opportunities.

Given the above, BLM may validly conclude that protecting environmental quality re-

quires it to manage BLM Lands so as to increase terrestrial carbon sequestration thereon. Management strategies for BLM Lands are established through resource management plans. Federal Land Policy and Management Act, section 202(a) (42 U.S.C. § 1712(a)) requires BLM to develop resource management plans providing for the use of areas of land. A resource management plan identifies resource goals for the area and specifies management practices to achieve those goals.²²⁸ All actions undertaken or approved by BLM must be consistent with the resource management plan.²²⁹

Under Federal Land Policy and Management Act, section 202(c)(1) (42 U.S.C. § 1712(c)(1)), in developing a resource management plan, BLM must “use and observe the principles of multiple use and sustained yield.” Federal Land Policy and Management Act, section 103(c) (42 U.S.C. § 1702(c)) defines the “multiple use” principle as requiring, among other things, the management of BLM Lands and the resources therein so as to ensure their utilization in the manner that will best meet the present and future needs of the American people and without permanent impairment of the quality of the environment.

As discussed above, the emission of carbon dioxide – an air pollutant – impairs environmental quality. Moreover, by contributing to climate change, it may also prevent the future utilization of BLM Lands. Increasing temperatures are accelerating the melting of glaciers, leading to sea level rises that threaten to damage or destroy coastal property.²³⁰ Coastal and other areas will also be affected flooding, hurricanes, and other extreme weather.²³¹

Given the above, reducing carbon dioxide emissions is vital to ensure that BLM Lands are available to meet the needs of future generations and prevent any impairment of environmental quality. To this end, BLM may take steps to promote terrestrial carbon sequestration. BLM could identify increased sequestration as a resource goal and adopt management strategies to achieve that goal. BLM could also prevent land uses that reduce carbon sequestration and/or require mitigation to avoid, minimize, or offset such effects. This could occur through the landscape-level planning process currently being undertaken by the DOI.

On October 31, 2013, Secretary of the Interior Sally Jewell issued Secretarial Order 3330 requiring the DOI’s Energy and Climate Change Taskforce to develop a strategy to improve the department’s mitigation practices.²³² The strategy, released in April 2014, provides for landscape-scale management of the land and resources under the jurisdiction of the DOI.²³³ Relevantly, the strategy requires the DOI to, among other things, establish management objectives on a landscape²³⁴ basis, identify landscape-scale issues and threats to the achievement of those objectives, and develop landscape-scale strategies to address those impacts and threats.²³⁵ The strategies must be incorporated into existing plans for use of the landscape, such as BLM’s resource management plans, and guide future land use decisions.²³⁶

FINDING 13

BLM could adopt management practices that increase terrestrial carbon sequestration on BLM Lands.

4.2.5. FACILITATING GEOLOGICAL CARBON SEQUESTRATION ON BLM LANDS

BLM can also do much to encourage geological carbon sequestration, whereby carbon dioxide is captured at its source and injected underground into permeable rock units, such as oil and gas fields, coal beds, and deep saline formations, for long-term storage.

The U.S Geological Survey estimates that between 2,535 and 4,079 billion tons of carbon dioxide could be stored in underground geological formations in the U.S.²³⁷ BLM has broad authority to permit geological carbon sequestration on BLM Lands.

Federal Land Policy and Management Act, section 302(b) (42 U.S.C. § 1732(b)) authorizes the Secretary of the Interior to issue leases, permits, and easements authorizing the use, occupancy, and development of BLM Lands. Regulations issued under the Federal Land Policy and Management Act (43 U.S.C. § 1701 et seq.) indicate that authorizations may be granted for “any use [of BLM Lands] not specifically authorized under other laws or regulations and not specifically forbidden by law.”²³⁸ The use of BLM Lands for geological carbon sequestration is neither authorized nor forbidden by law²³⁹ and, as such, may be permitted under section 302(b) of the Federal Land Policy and Management Act (42 U.S.C. § 1732(b)). In this regard, the DOI has acknowledged that “[t]he statute and regulations are

sufficiently broad to allow for a variety of authorizations related to geological sequestration.”²⁴⁰

Notwithstanding this, BLM’s resource management plans do not currently allow geological carbon sequestration on any land. According to BLM, the resource management plans must be amended before sequestration activities occur.²⁴¹ BLM has indicated that it will consider plan amendments on a case-by-case basis when and where sequestration is proposed.²⁴² As plan amendments can take several months or years to finalize, this approach imposes significant time and other costs on project proponents and may therefore discourage investment in sequestration projects.²⁴³

The Obama Administration has encouraged executive agencies to remove impediments to geological carbon sequestration.²⁴⁴ To this end, BLM could amend its resource management plans to identify BLM Lands which are suitable for use for geological carbon sequestration on an ex ante basis (i.e., before a specific request for authorization to undertake such activities is received). BLM has previously used this approach to amend its resource management plans to facilitate the development of large-scale renewable energy projects. For example, in December 2005, BLM amended fifty-two resource management plans to identify BLM Lands on which wind energy development may be permitted.²⁴⁵ More recently, in October 2012, BLM revised eighty-nine resource managements to allow for the use of BLM Land for utility-scale solar energy projects.²⁴⁶

FINDING 14

BLM could update its resource management plans to identify BLM Lands suitable for geological carbon sequestration.

5. FEDERAL DAMS

KEY POINTS

- Hydroelectric power is a reliable source of clean energy. Using hydroelectric power in place of carbon-intensive fossil fuels in electricity generation can reduce greenhouse gas emissions and thereby mitigate global climate change.
- The DOI, through Reclamation, has developed hydroelectric power on federal dams and related water infrastructure. Reclamation operates fifty-eight hydroelectric power plants, supplying approximately forty million MWh of electricity to over nine million people annually.
- In recent years, Reclamation has invested in equipment upgrades and other capital improvements aimed at increasing hydroelectric generation at its existing power plants. Reclamation has replaced turbines at twenty power plants since 2009 and is scheduled to replace another four turbines by 2017.
- Building on these efforts, Reclamation could undertake capital improvements at its other hydroelectric power plants. Research suggests that turbine upgrades would increase generating capacity at all but one of these power plants, with generation at twenty-six plants predicted to increase by more than three percent.
- Reclamation could also support the development of new hydroelectric power plants. Recent research suggests that over 500 existing sites on federal dams and related infrastructure have undeveloped hydroelectric potential. At least seventy sites, with the capability to generate over one million MWh of electricity annually, could be economically feasible to develop. Reclamation could develop hydroelectric power plants at these sites itself or allow a third party to do so under a lease of power privilege.
- Reclamation can further reduce fossil fuel energy use by establishing renewable generating systems to power its water pumps and other equipment.

The use of coal, oil, and other fossil fuels in electricity generation emits greenhouse gases that contribute to climate change. Research by the EPA indicates that electricity generation was the largest anthropogenic source of greenhouse gas emissions in the U.S. in 2012, accounting for over thirty one percent of the national greenhouse gas inventory.²⁴⁷ Replacing fossil fuel power plants with cleaner renewable energy sources is therefore vital for mitigating climate change. Hydroelectric power – which uses flowing water to generate electricity – is one such source.

Hydroelectric power is an important source of renewable energy in the U.S. In 2012, conventional hydroelectric power²⁴⁸ accounted for seven percent of total, and fifty five percent of renewable, electricity generation nationally.²⁴⁹ Almost fifteen percent of this power is supplied

by the DOI.²⁵⁰ The DOI, through Reclamation, operates fifty-eight hydroelectric power plants with an installed capacity of 14,000 MW.²⁵¹ These plants provide approximately forty million MWh of electricity to over nine million people annually.²⁵² Producing an equivalent amount of energy from fossil fuels would require more than 23.5 million barrels of crude oil or 6.8 million tons of coal and emit approximately twenty seven million tons of carbon dioxide each year.²⁵³

Like other renewable power systems, hydroelectric power plants generate electricity without emitting greenhouse gases or other air pollutants.²⁵⁴ In addition, hydroelectric power also has a number of other benefits. Hydroelectric power plants provide consistent, reliable generation that can be quickly dispatched and adjusted to meet changes in electricity de-



Hoover Dam. Courtesy of Etienne Le Suetur.

mand.²⁵⁵ Moreover, such plants are highly efficient, operating at between eighty-five and ninety percent efficiency.²⁵⁶

Notwithstanding this, increasing use of hydroelectric power is not a perfect solution to climate problems. The construction of dams and reservoirs to store water for hydroelectric generation emits substantial carbon dioxide and other air pollutants.²⁵⁷ Moreover, it also has other serious negative environmental effects. Most significantly, dams disturb the natural flow of water in rivers. This alters the river's temperature, sediment load, chemical composition, and other physical properties, adversely affecting aquatic plants and animals. For example, water stored at the base of dams is extremely cold and oxygen-poor. When this water is released into the river, it may kill fish that have adapted to warmer, oxygen-rich conditions. In addition, dams also block migratory fish species from their spawning, rearing, and feeding habitats. These impacts can be minimized by restricting hydroelectric generation to existing dams. However, even at existing dams, installing turbines and other generating equipment will likely lead to some fish deaths.

There are currently over 80,000 dams in the U.S.²⁵⁸ These dams, and associated water infrastructure, can be used to increase hydroelectric generation. This may occur in two ways. Firstly, new hydroelectric power plants may be installed on existing water infrastructure that has not previously been used to generate electricity. Additionally, power plants currently operating on such infrastructure may be upgraded or expanded.

Recent research suggests that there is significant undeveloped hydroelectric potential on existing dams and other water infrastructure managed by the DOI's Reclamation. A 2011 study identified 191 Reclamation-owned sites, including dams, canals, tunnels, dikes, and siphons, with undeveloped hydroelectric capacity of 268 MW.²⁵⁹ Supplemental research conducted in 2012 found that an additional 104 MW of undeveloped hydroelectric capacity is available at 373 sites on pipelines, chutes, and other water conduits owned by Reclamation.²⁶⁰ New power plants developed on these sites could produce up to 1.5 million MWh of electricity annually.²⁶¹ In addition, upgrading existing power plants on federal dams and other water infrastructure could increase annual electricity production by a further 750,000 MWh.²⁶² Together, the new and upgraded plants would produce enough power to serve almost 200,000 households.²⁶³

This chapter identifies actions the DOI may take to expand hydroelectric generation at existing dams and other water infrastructure. The DOI's regulatory authority with respect to hydroelectric projects is outlined in section 5.1 below. Section 5.2 then discusses ways in which the DOI may use this authority to increase the development of hydroelectric resources.

5.1. THE DOI'S REGULATORY JURISDICTION OVER HYDROELECTRIC PROJECTS

The DOI has broad authority to construct and operate dams and associated infrastructure. Reclamation Act, section 2 (43 U.S.C. § 411)

authorizes the Secretary of the Interior to construct irrigation works for the storage, diversion, and development of waters. The Secretary, through Reclamation, has built 476 dams and 8,116 miles of canals²⁶⁴ in seventeen western states.²⁶⁵ This infrastructure is used to control floods, regulate river flows, and store and deliver water for residential, industrial, and agricultural use.²⁶⁶ Additionally, dams and canals can also be used to generate hydroelectric power.²⁶⁷

Congress has authorized Reclamation to construct and operate hydroelectric power projects at some federal dams through site-specific legislation. At these locations, Reclamation can develop hydroelectric power plants itself or allow a third party to do so under a lease of power privilege. Under Town Sites and Power Development Act, section 5 (43 U.S.C. § 522), where Reclamation has authority to develop power on a federal water project, it may lease this power privilege to a third party. Reclamation Project Act, section 9(c)(1)(B) (43 U.S.C. § 485h(c)(1)(B)) limits the term of the lease to no more than forty years.

Hydroelectric power plants on other federal dams are under the jurisdiction of the Federal Energy Regulatory Commission (“**FERC**”). Federal Power Act, section 4(e) (16 U.S.C. § 797(e)) authorizes FERC to grant licenses for the construction, operation, and maintenance of dams and other works necessary or convenient for the development of power “in any of the streams or other bodies of water over which Congress has jurisdiction under its authority to regulate commerce with foreign nations and among the several States, or upon any part of

the public lands and reservations of the United States.” FERC’s jurisdiction is limited to hydroelectric projects under private, state, and municipal ownership. FERC does not have jurisdiction over projects owned by Reclamation or other federal entities.

5.2. ACTIONS AVAILABLE TO THE DOI TO EXPAND HYDROELECTRIC GENERATION AT EXISTING DAMS

The DOI, through Reclamation, has constructed dams and other works for storing and transporting water. Many of these works could support hydroelectric generation. Reclamation has identified 564 existing dams and other sites where new hydroelectric power plants could be installed to produce an additional 1.5 million MWh of electricity annually.²⁶⁸ Assuming these plants displace fossil fuel generators, this would reduce the electricity industry’s annual carbon dioxide emissions by over 1.2 million tons.²⁶⁹ Fossil fuel generation, and its associated greenhouse gas emissions, could be further reduced by increasing output at existing hydroelectric power plants operated by Reclamation.

5.2.1. DEVELOPING NEW HYDROELECTRIC POWER PLANTS AT EXISTING DAMS

Reclamation is responsible for constructing and operating dams and associated infrastructure. Legislation sets out the purposes for which each Reclamation dam may be used. Congress has permitted Reclamation to develop hydroelectric power at many sites (“**permitted sites**”). While Reclamation has built hydroelectric power plants at some permitted sites, others

remain undeveloped. At these locations, Reclamation could develop hydroelectric power plants itself or allow third parties to do so under a lease of power privilege. This would increase hydroelectric power production, reducing the need for fossil fuel generation and thereby mitigating greenhouse gas emissions.

Federal hydroelectric projects typically require authorization and funding by Congress.²⁷⁰ However, in some circumstances, Reclamation may undertake such projects without Congressional support. Under Reclamation Project Act, section 9(a) (43 U.S.C. § 485h(a)), before constructing any new project, or any division of, or supplemental works on, an existing project, the Secretary of the Interior must investigate and prepare a report for Congress and the President on the engineering feasibility of construction, the estimated cost of construction, and the part of that estimated cost which can be allocated to irrigation, municipal water supply, power, or other purposes and recovered through charges therefor. If the Secretary finds that construction is feasible and the costs thereof can be recovered through power and/or other charges, the project is deemed to be authorized and may be undertaken without further legislative approval.

In a study completed in 2011, Reclamation identified 191 existing dams and other sites with undeveloped hydroelectric potential.²⁷¹ Reclamation undertook a cost benefit analysis to assess the economic viability of developing hydroelectric power plants at each site. The results of this analysis are summarized in Table 1.

Table 1: Existing Reclamation sites with undeveloped hydroelectric potential²⁷²

Benefit to cost ratio	Number of sites	Potential annual production (MWh)
0 – 0.25	62	35,041
0.25 – 0.5	35	57,955
0.5 – 0.75	24	67,375
0.75 – 1.0	27	147,871
1.0 – 2.0	36	375,353
≥ 2.0	7	484,653
Total	191	1,168,248

For the economic calculations, Reclamation assessed the total cost of constructing, operating, and maintaining a hydroelectric power plant at each site.²⁷³ These costs were then compared to the likely benefits of development, namely the revenue received through energy sales (based on current and forecast prices) and financial incentives available under federal and state renewable energy programs, to produce a benefit to cost ratio.²⁷⁴ As indicated in Table 1 above, forty-three sites were found to have a benefit to cost ratio equal to or greater than one.²⁷⁵

Reclamation’s analysis indicates that, in at least forty-three locations, the cost of constructing a hydroelectric power plant could be recovered through the sale of power it generates. Where this is the case, construction at permitted sites may be deemed authorized under Reclamation Power Act, section 9(a) (43

U.S.C. § 485h(a)). As a result, Reclamation could undertake such construction without obtaining approval from Congress.

Alternatively, Reclamation may allow third parties to develop new hydroelectric power plants on existing federal dams and other water infrastructure. Under Town Sites and Power Development Act, section 5 (43 U.S.C. § 522), Reclamation may issue a lease of power privilege authorizing the holder to construct hydroelectric power plants on permitted sites. Reclamation Project Act, section 9(c)(2) (43 U.S.C. § 485h(c)(2)(A)) requires Reclamation to first offer the lease to any irrigation district or water users association operating or receiving water from the site. Under Reclamation Act, section 9(c)(2)(B) (43 U.S.C. § 485h(c)(2)(B)), if the irrigation district or water users association does not accept the lease, it may be offered to other interested parties.

Non-federal hydroelectric development is currently limited to just forty-seven sites.²⁷⁶ On most of these sites, Reclamation is not permitted to develop hydroelectric power plants.²⁷⁷ Hydroelectric development on these sites takes place pursuant to a license issued by FERC under the Federal Power Act (16 U.S.C. § 791a et seq.).²⁷⁸ As at September 2013, just seven non-federal hydroelectric projects were operating on permitted sites under a lease of power privilege issued by Reclamation.²⁷⁹

In 2012, Reclamation adopted major changes to its leasing process designed to reduce the time and other costs faced by developers in obtaining approval for hydroelectric power plants on existing dams. Under the new process, Reclamation may solicit proposals for

hydroelectric development on existing dams on its own motion or upon request.²⁸⁰ Reclamation typically holds solicitations after receiving a development request. Bringing solicitations forward, such that they are held before requested, may accelerate non-federal hydroelectric development. As only one project can be developed at each site, developers will have a strong incentive to participate in early solicitations. Rules issued by Reclamation require development to begin within a limited time after issuance of the lease.²⁸¹

FINDING 15

Reclamation could develop hydroelectric power plants at permitted sites or authorize third parties to undertake such development through a lease of power privilege.

5.2.2. UPGRADING HYDROELECTRIC POWER PLANTS CURRENTLY OPERATING ON FEDERAL DAMS

In addition to constructing new hydropower facilities, Reclamation could also upgrade power plants currently operating at federal dams to increase hydroelectric generation. Many of Reclamation's current hydroelectric projects are approaching, or already exceed, their nominal life expectancy of fifty years.²⁸² As of 2007, the median age of Reclamation's hydroelectric power plants was fifty-one years.²⁸³

A 2010 study for Reclamation found that efficiency improvements at existing hydroelectric power plants could significantly increase electricity output.²⁸⁴ The required efficiency improvements take one of two forms. First,

existing turbines may be rehabilitated such that they operate similarly to a new turbine of the same vintage in its original condition.²⁸⁵ Alternatively, old turbine runners and appurtenant parts may be replaced with new, modern components.²⁸⁶ Making these changes would increase electricity generation at all but one of the fifty-eight hydroelectric power plants currently operated by Reclamation.²⁸⁷ Generation at thirty-six plants would increase by more than three percent, resulting in additional output of almost 400,000 MW annually.²⁸⁸ This would reduce the need for fossil fuel generation, avoiding the emission of sixteen million tons of carbon dioxide over the life of the plant.²⁸⁹

Congress has expressed strong support for projects designed to increase hydroelectric generation by enhancing efficiency at power plants. In section 243 of the Energy Policy Act of 2005 (42 U.S.C. § 15882), Congress directed the Secretary of Energy to make incentive payments available to the owners and operators of hydroelectric power plants at existing dams to finance capital improvements directly related to increasing the efficiency thereof. To this end, Congress authorized the appropriation of \$10 million in each year from 2006 to 2015.

In view of its potential benefits, Reclamation has committed to “increasing the generation of hydropower at existing facilities and dams through retrofits or modifications...[including] initiating efficiency and/or capacity upgrades.”²⁹⁰ Reclamation has replaced twenty turbines since 2009, increasing total annual generation by approximately 200,000 MWh.²⁹¹ Four additional turbine

replacements are scheduled to occur by 2017.²⁹² While this is an encouraging first step, further efficiency enhancements are possible. As discussed above, research commissioned by Reclamation indicates that all but one of its fifty-eight hydroelectric power plants would benefit from turbine rehabilitation or replacement.²⁹³

Reclamation can invest in efficiency enhancements without Congress adopting new appropriation measures. As Reclamation Commissioner Michael L. Connor has indicated, revenues from electricity sales can be “used to finance operations, maintenance, and replacement on Reclamation hydropower facilities”.²⁹⁴ This may include projects designed to increase hydropower efficiency.

FINDING 16

Reclamation could use revenues obtained from electricity sales to fund efficiency improvements at hydroelectric power plants currently operating on federal dams and other water infrastructure.

5.2.3. DEVELOPING RENEWABLE GENERATING SYSTEMS TO MEET RECLAMATION’S POWER NEEDS

As well as being the second largest producer of electricity in the U.S., Reclamation is also one of the nation’s greatest electricity consumers.²⁹⁵ Reclamation uses significant amounts of electricity in operating its pumping plants, water treatment facilities, and other equipment.²⁹⁶ Some of this electricity is derived from renewable generating systems, including hydroelectric power plants on federal dams.²⁹⁷

In addition, Reclamation also uses fossil fuel based generation. For example, Reclamation is a part owner of the Navajo Generating Station; a 2,250 MW coal-fired power plant in northern Arizona.²⁹⁸ Power from the Navajo Generating Station is used to, among other things, operate the pumps that move water through the Central Arizona Project from Lake Havasu in western Arizona to users in central and southern parts of the state.²⁹⁹

The Navajo Generating Station and other coal-fired power plants emit greenhouse gases that contribute to climate change. Reclamation can help to reduce such emissions by retiring its existing coal-fired power plants and replacing them with cleaner renewable power systems. Such action is consistent with President Obama’s recent direction to executive agencies to increase their use of renewable energy sources.³⁰⁰

Significant renewable energy potential exists on land owned by Reclamation. Indeed, these lands have “some of the greatest concentrations of solar and wind resources in the nation.”³⁰¹ Recognizing this, Reclamation has committed to increasing its use of solar, wind, and other renewable energy sources. To this end, Reclamation has installed solar generators to power its structures and equipment in the mid-Pacific and upper and lower Colorado regions.³⁰² Building on these efforts, Reclamation may develop renewable power systems to meet its power needs in other areas.

FINDING 17

Reclamation could investigate opportunities for expanding the use of renewable energy in powering its facilities and equipment.

6. NATIONAL PARKS

KEY POINTS

- The national park system provides a visible example of the impacts of climate change. Increased temperatures, reduced rainfall, and other climatic variations will likely destroy many of the natural and manmade features of national parks and cause the extinction of some plant and animal species therein.
- The DOI's NPS is responsible for managing national parks to conserve their scenery, wildlife, and natural and historic objects and provide for their enjoyment by current and future generations.
- As the manager of the national park system, NPS is uniquely placed to publicize climate change. To this end, NPS has conducted research on the impacts of climate change on national parks and distributed the results of that research to park staff and visitors.
- Building on these efforts, NPS could conduct educational lectures on climate change for the broader community. By highlighting the effects of climate change, this may encourage action to address its cause.
- NPS can also "lead by example," adopting effective strategies for limiting greenhouse gas emissions and other activities that contribute to climate change.

Climate change poses a serious threat to national park resources. Increasing temperatures and resulting declines in snow and ice cover are expected to cause the relocation or extinction of animal and plant species within the national park system.³⁰³ Moreover, by increasing sea levels, they may also damage or destroy the natural, cultural, and/or historical features national parks are intended to protect.³⁰⁴ These features, together with park infrastructure, will also be affected by more intense wildfires, thunderstorms, hurricanes, and other extreme weather events.³⁰⁵

Given their climate sensitivity, national parks can make an important contribution to our understanding of climate change. National parks can serve as laboratories for climate research.³⁰⁶ Information regarding current and historic park conditions can provide a baseline

from which to measure future climatic changes.³⁰⁷ Additionally, by showing how ecosystems have responded to past climate variations, park information can also be used to predict the impact of such changes.³⁰⁸ In addition to advancing scientific knowledge, national parks can also be used to increase public awareness of climate change. As the effects of climate change occur over long time periods and wide geographic areas, it is often perceived as an abstract and distant threat.³⁰⁹ National parks can be used to demonstrate the real and immediate effects of climate change and thereby inspire mitigation measures.³¹⁰ As the DOI's NPS has observed, "[w]ith more than three million visitors each year, the NPS has an unparalleled ability to tell compelling stories and connect people with places they care about."³¹¹



Yosemite National Park, California. Courtesy of Etienne Le Sueur.

Section 6.1 below outlines the DOI's regulatory authority over the national park system. Section 6.2 then discusses ways in which the DOI can use this authority to increase awareness of climate change.

6.1. THE DOI'S REGULATORY JURISDICTION OVER THE NATIONAL PARK SYSTEM

Under National Park Service Organic Act, section 1 (16 U.S.C. § 1), the DOI's NPS is responsible for managing national parks, monuments, and reservations (together the "**national park system**") to conserve their scenery, wildlife, and natural and historic objects, and provide for their enjoyment in such manner as will leave them unimpaired for future generations.

Today, the national park system is comprised of 401 sites, covering over eighty four million acres of land across all U.S. states, the District of Columbia, and the U.S. territories of American Samoa, Guam, Puerto Rico, and the Virgin Islands.³¹² The system includes 124 historical sites, seventy eight national monuments, fifty nine national parks, sixteen battlefields, nine military areas, ten seashores, four lakeshores, four parkways, and two reserves.³¹³

National Park System General Authorities Act, section 1 (16 U.S.C. § 1a-1) requires protection of the natural and cultural resources of the national park system for the benefit and inspiration of all people. To this end, National Park System General Authorities Act, section 3 (16 U.S.C. § 1a-2) authorizes the Secretary of the Interior to, among other things, regulate human activities within the national park system and oversee the use of water and other re-

sources therefrom. The Secretary of the Interior performs these functions through NPS.

6.2. ACTIONS AVAILABLE TO THE DOI TO INCREASE PUBLIC AWARENESS OF THE IMPACT OF CLIMATE CHANGE ON THE NATIONAL PARK SYSTEM

As the manager of the national park system, NPS can play an important role in collecting and disseminating information on the impacts of climate change. By raising awareness of climate change's real and immediate effects, this may encourage more climate-sensitive decision-making both within and outside NPS.

NPS has broad authority to research the causes and effects of climate change. National Park System General Authorities Act, section 3(j) (16 U.S.C. § 1a-2(j)) authorizes NPS to enter into cooperative agreements with public and private entities for the purpose of undertaking research on the resources of the national park system. In its 2010 Climate Change Response Strategy, NPS indicated that it would "collaborate with scientific agencies and institutions to advance climate change science."³¹⁴ More recently, NPS's Climate Change Action Plan for 2012 to 2014 provided for the establishment of science partnerships to facilitate the use of national parks as laboratories for climate research.³¹⁵ To this end, NPS has recently partnered with the DOI's Climate Science Centers, the National Oceanic and Atmospheric Administration's Regional Integrated Science and Assessment team, and other scientific entities to research the impacts of climate change on national parks.³¹⁶

NPS can distribute information obtained through its scientific research to park staff, visitors, and the broader community. The National Parks Act of 1946 (16 U.S.C. § 17j-2) authorizes NPS to conduct “educational lectures in or in the vicinity of or with respect to the national parks, monuments, and other reservations under [its] jurisdiction.” As part of these education lectures, NPS communicates climate change information to park staff and visitors. In its 2010 Climate Change Response Strategy, NPS indicated that it would take steps to increase climate change knowledge among its staff.³¹⁷ This staff training was continued under NPS’s Climate Action Plan for 2012 to 2014, which committed to “[b]uilding a workforce that is literate about climate change effects and response options.”³¹⁸ Moreover, NPS also agreed to enhance visitor understanding of climate change, including by developing interpretive exhibits and holding educational talks on the climatic variations affecting national parks.³¹⁹

These educational programs are an important first step in raising awareness of the impacts of climate change. Building on these programs, NPS may also educate park staff and visitors on possible means of mitigating those impacts. For example, NPS could distribute information on the climate benefits of using wind, solar, and other renewable energy sources. To this end, NPS could promote renewable energy projects in the vicinity of national parks and other reservations. One such project is the Desert Sunlight Solar Farm currently being constructed on land adjacent to the Joshua Tree National Park in south eastern

California.³²⁰ NPS could provide visitors to the Joshua Tree National Park with information about the project, emphasizing its potential to reduce greenhouse gas emissions and thereby mitigate climate change.

FINDING 18

NPS could provide information about renewable energy projects in the vicinity of national parks.

To date, NPS has primarily focused on educating park staff and visitors about climate change. Beyond updating its website, NPS has done little to distribute climate information to the wider community. To remedy this deficiency, NPS may hold lectures to educate community members about the impacts of climate change on the national park system and options for mitigating those impacts.

FINDING 19

NPS could conduct educational lectures on the causes and effects of climate change in communities surrounding national parks.

In addition to educating the public about climate change, NPS can also demonstrate effective mitigation strategies.³²¹ Recognizing this, NPS has agreed to minimize its “carbon footprint...through aggressive commitment to environmentally preferable operations.”³²² To this end, NPS’s 2012 Green Parks Plan set a goal of reducing greenhouse gas emissions from on-site fossil fuel combustion and electricity consumption from the grid (i.e., scope 1 and 2 emissions) by thirty five percent below 2008 levels by 2020.³²³ By the same year,

NPS aims to reduce greenhouse gas emissions from indirect sources such as employee travel (i.e., scope 3 emissions) by ten percent below 2008 levels.³²⁴

NPS has made significant progress towards achieving these climate goals, reducing scope 1 and 2 emissions by thirteen percent in 2012.³²⁵ In the same year, scope 3 emissions fell by seven percent. Nevertheless, certain aspects of NPS's operations remain highly carbon intensive.

NPS estimates that approximately half of its greenhouse gas emissions result from the use of fossil fuels in vehicles for employee transportation.³²⁶ To date, NPS's efforts to reduce fossil fuel use in, and control greenhouse gas emissions from, employee vehicles have been largely unsuccessful.³²⁷ In 2012, fossil fuel use in NPS vehicles rose by approximately twelve percent compared to the 2005 baseline,³²⁸ generating over 164,000 metric tons of carbon dioxide equivalent.³²⁹

To reduce carbon dioxide and other greenhouse gas emissions from employee transportation, NPS may replace fossil fuel powered vehicles with electric, hybrid, and other green transportation options. National Parks Omnibus Management Act, section 802(a)(d) (16 U.S.C. § 1a-2(d)) authorizes the Secretary of the Interior to purchase field and special purpose equipment, including motor vehicles, required by NPS employees to perform their assigned functions.³³⁰ Given the large land area managed by NPS,³³¹ many employees will need vehicle access to execute their duties. These employees may be given low greenhouse gas emitting vehicles.

FINDING 20

NPS could replace fossil fuel powered vehicles with cleaner transportation options, including electric and hybrid vehicles.

NPS can also do much to reduce visitor use of fossil fuel powered vehicles. To this end, NPS could provide shuttle bus and/or other shared transportation services for park visitors. NPS already provides such services in a number of national parks. For example, since 1997, NPS has offered a shuttle service in Zion National Park in Utah.³³² The shuttle is the only means of accessing the main road through the Park – the Zion Canyon Scenic Drive – which is closed to private vehicles at certain times of the year.³³³ NPS could adopt a similar approach in other national parks.

FINDING 21

NPS could provide shared transportation services in national parks.

7. ENDANGERED SPECIES

KEY POINTS

- Climate change will have profound impacts on fish, wildlife, and plants throughout the U.S. Increasing temperatures and other climatic variations are expected to alter species' morphology, physiology, and behaviors. Moreover, climate change is also likely to modify or destroy species' essential habitats. Species that are unable to adapt to these changes face extinction.
- The Endangered Species Act ("**ESA**") (16 U.S.C. § 1531 et seq.) gives FWS broad regulatory authority to protect terrestrial and freshwater species from extinction. FWS's regulatory duties include identifying threatened and endangered species, assessing the impact of federal projects on species and their habitats, and preventing activities that kill, harm, or otherwise "take" species.
- In recent years, FWS has listed some species affected by climate change as threatened or endangered under the ESA (16 U.S.C. § 1531 et seq.). However, to date, FWS has refused to regulate greenhouse gas emissions and other climate-damaging activities.
- Going forward, FWS could identify climate change as a relevant factor to be taken into account when listing threatened and endangered species and assessing the impact of federal projects thereon.
- FWS could also use its authority under the ESA (16 U.S.C. § 1531 et seq.) to enjoin activities that emit greenhouse gases and/or otherwise contribute to climate change and thereby adversely affect threatened or endangered species.

Climate change will have profound impacts on fish, wildlife, and plants. For some species, climate change will result in the reduction or elimination of essential habitat needed for survival.³³⁴ For others, altered conditions will disrupt breeding, migration, and other critical life stages, causing changes in the size and distribution of species populations.³³⁵ Moreover, all species will be affected by increased frequency and intensity of disease and pest outbreaks caused by a warming environment.³³⁶

The IPCC has warned that between twenty and thirty percent of species will be at increased risk of extinction if global temperature rises exceed 2.7 to 4.5°F (1.5 to 2.5°C).³³⁷ Temperature increases above 6.3°F (3.5°C) could lead to extinction rates of between forty and seventy percent.³³⁸

Given the threats posed by global climate change, federal legislation providing for the protection of fish, wildlife, and plant species may provide a useful tool for controlling greenhouse gas emissions. One relevant statute is the ESA (16 U.S.C. §§ 1531 et seq.), which establishes a comprehensive framework for identifying and protecting threatened and endangered species and the ecosystems upon which they depend. The DOI's FWS administers the ESA (16 U.S.C. § 1531 et seq.) for terrestrial and freshwater species.³³⁹

This chapter identifies actions the DOI may take, under the ESA (16 U.S.C. § 1531 et seq.), to protect species against climate change. Section 7.1 outlines the DOI's regulatory authority under the ESA (16 U.S.C. § 1531 et seq.). Section 7.2 then discusses ways in which the DOI can use this authority to limit

greenhouse gas emissions and other activities that contribute to climate change.

7.1. THE DOI'S REGULATORY JURISDICTION OVER ENDANGERED SPECIES

The ESA (16 U.S.C. § 1531 et seq.) gives the Secretary of the Interior broad regulatory authority to protect endangered and threatened species. The Secretary of the Interior has delegated this authority to FWS.

ESA, section 4(a)(1) (16 U.S.C. § 1533(a)(1)) requires FWS to identify terrestrial and freshwater species that are endangered or threatened. For the purposes of the Act, a species is "endangered" if it "is in danger of extinction throughout all or a significant portion of its range."³⁴⁰ A "threatened" species is one that "is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."³⁴¹

Under ESA, section 4(a)(3) (16 U.S.C. § 1533(a)(3)), FWS must, at the time of identifying an endangered or threatened species, designate the critical habitat thereof. ESA, section 3(5)(A) (16 U.S.C. § 1532(5)(A)) defines "critical habitat" to include those geographic areas occupied by the species that contain the physical or biological features essential to its conservation and require special management and other areas essential to the species' conservation.

Under the ESA (16 U.S.C. § 1531 et seq.), FWS is charged with protecting endangered and threatened species and their critical habitat. To this end, ESA, section 7(a)(2) (16 U.S.C. § 1536(a)(2)) requires FWS to consult

with federal agencies to ensure that their actions do not jeopardize the continued existence of endangered or threatened species or destroy or adversely modify their critical habitat. Moreover, under ESA, section 9 (16 U.S.C. § 1538), the FWS can enjoin government officials and/or private parties from killing, harming, or otherwise “taking” endangered species.

7.2. ACTIONS AVAILABLE TO THE DOI TO PROTECT ENDANGERED SPECIES AGAINST CLIMATE CHANGE

The stated purpose of the ESA (16 U.S.C. § 1531 et seq.) is “to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved [and] to provide a program for the conservation of such...species.”³⁴² To this end, the ESA (16 U.S.C. § 1531 et seq.) directs FWS to protect species from all threats regardless of their origin or form. One such threat is global climate change. Indeed, one preeminent ecologist has described climate change as “a major threat to the survival of species and the integrity of ecosystems.”³⁴³ However, despite this, FWS has so far been reluctant to use its authority under the ESA (16 U.S.C. § 1531 et seq.) to control greenhouse gas emissions that contribute to climate change.³⁴⁴

There are several actions FWS may take, pursuant to its authority under the ESA (16 U.S.C. § 1531 et seq.), to prevent and control climate change. This may be achieved directly by, for example, enjoining activities that emit greenhouse gases and/or otherwise contribute to climate change. Similar benefits may also be achieved through more indirect channels, in-

cluding by reporting on the impacts of climate change on species and their habitats.

7.2.1. IDENTIFYING SPECIES JEOPARDIZED BY CLIMATE CHANGE

ESA, section 4(a)(1) (16 U.S.C. § 1533(a)(1)) requires FWS to determine whether any species is endangered or threatened. As part of this determination, FWS may consider the effects of climate change on species. Listing climate-sensitive species under the ESA (16 U.S.C. § 1531 et seq.) may provide a cause of action against those emitting climate-changing pollutants.³⁴⁵ Moreover, by increasing awareness of climate change’s effects, it may also encourage polluters to voluntarily reduce or offset their emissions.

Under ESA, section 4(a)(1) (16 U.S.C. § 1533(a)(1)), FWS may list a species as threatened or endangered based on:

- (A) the present or threatened destruction, modification, or curtailment of its habitat or range;
 - (B) overutilization for commercial, recreational, scientific, or education purposes;
 - (C) disease or predation;
 - (D) the inadequacy of existing regulatory mechanisms; or
 - (E) other natural or manmade factors affecting its continued existence
- (together “**the listing criteria**”).

These listing criteria provide FWS with broad authority to consider the impact of climate change on fish, wildlife, and plants. With respect to criterion A, climate change will lead to atmospheric warming, sea level rise, and other ecological effects that have the potential

to destroy or modify species' habitat and thereby curtail their range.³⁴⁶ These ecological changes also increase the potential for disease outbreaks and/or the occurrence of new pathogens, making them relevant to criterion C.³⁴⁷ Similarly, climate change may also be considered under criteria D and E. Anthropogenic greenhouse gas emissions are arguably "man-made factors" that, by contributing to climate change, adversely affect species' ongoing existence.³⁴⁸ No effective regulatory mechanisms have been adopted at the national or international level to control these emissions.³⁴⁹

Recognizing this, FWS has listed several species as threatened or endangered due to climate change. Most famously, in 2008, FWS listed the polar bear (*ursus maritimus*) as a threatened species under the ESA (16 U.S.C. § 1531 et seq.) ("**polar bear listing**").³⁵⁰ The polar bear listing integrated an assessment of climate change in three key ways. Firstly, FWS examined the impact of climate change on the polar bear's habitat and range, concluding that increased temperatures would lead to the melting of sea ice used by the bears to hunt, breed, and travel.³⁵¹ Secondly, FWS noted the potential for new disease outbreaks resulting from the northward movement of pathogens associated with a warming environment.³⁵² Finally, FWS emphasized the inadequacy of existing regulatory mechanisms for controlling greenhouse gas emissions and addressing climate change.³⁵³

Consistent with this approach, the courts have held that FWS can and, in some circumstances, must consider the effects of climate change when making decisions under the ESA

(16 U.S.C. § 1531 et seq.).³⁵⁴ Similarly, Congress has also urged FWS to assess climate change's impact on species.³⁵⁵ However, notwithstanding this, FWS's rules and regulations do not currently require consideration of climate change in listing decisions. To remedy this deficiency, FWS may revise its regulations to require consideration of the impact of climate change on species. This would ensure that climate change is considered in all future listing decisions, regardless of FWS employees' personal views on climate science, and thereby guarantee the protection of all climate-threatened species under the ESA (16 U.S.C. § 1531 et seq.). Moreover, by increasing awareness of the potential impacts of climate change, the policy may also promote more climate-sensitive decision-making both within and outside FWS.

FINDING 22

FWS could consider the impact of past and likely future changes in climate when determining whether to list a species as endangered or threatened under the ESA (16 U.S.C. § 1531 et seq.).

7.2.2. PREVENTING ACTIVITIES THAT CONTRIBUTE TO CLIMATE CHANGE

Once a species is listed under the ESA (16 U.S.C. § 1531 et seq.), it is afforded protection over competing human activities.³⁵⁶ The two primary mechanisms through listed species are protected are set out in sections 7 and 9 of the ESA (16 U.S.C. §§ 1536, 1538). ESA, section 7 (16 U.S.C. § 1536) prevents federal agencies undertaking any action that is likely to jeopard-

ize the continued existence of threatened or endangered species. ESA, section 9 (16 U.S.C. § 1538) prohibits the “taking” of any endangered species. Given the significant scientific evidence linking climate change to species decline, these provisions may provide a useful tool for controlling greenhouse gas emissions and other climate-damaging activities.³⁵⁷

The Obama Administration has previously indicated that it does not consider the ESA (16 U.S.C. § 1531 et seq.) to be an appropriate vehicle for regulating greenhouse gas emissions.³⁵⁸ Consistent with the Administration’s position, the DOI has refused to use its authority under the ESA (16 U.S.C. § 1531 et seq.) to regulate activities emitting greenhouse gases. However, in the future, the DOI could regulate such activities.

ESA, section 7(a)(2) (16 U.S.C. § 1536(a)(2)) requires each federal agency to ensure, through consultation with FWS, that its actions are “not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical] habitat.” This arguably requires federal agencies to consult on actions that release greenhouse gases and/or otherwise contribute to climate change.

Regulations implementing the ESA (16 U.S.C. § 1531 et seq.) require federal agencies to consult with FWS on “any action [that] may affect listed species or critical habitat.”³⁵⁹ An action may affect listed species or critical habitat either directly or indirectly.³⁶⁰ The “indirect effects” of an action include all effects caused by the action that are later in time, but still reasonably certain to occur.³⁶¹

FWS’s rules and regulations do not provide for consultation on actions that affect listed species or critical habitat solely by emitting greenhouse gases. On the contrary, in its 2008 polar bear listing, FWS asserted that consultation is not required for such actions.³⁶² In support of this assertion, FWS claimed that there is insufficient evidence to show that greenhouse gas emissions threaten species, stating:

“the best scientific data available today are not sufficient to draw a causal connection between [greenhouse gas] emissions from a facility in the conterminous 48 States to effects to polar bears and their habitat in the Arctic, nor are there sufficient data to establish that such impacts are “reasonably certain to occur” to polar bears.”³⁶³

However, recent IPCC and other studies arguably establish the critical link between human activity, climate change, and species extinction.

In its fifth climate assessment report, issued in June 2013, the IPCC concluded that it is “extremely likely” that anthropogenic greenhouse gas emissions are the dominant cause of global warming.³⁶⁴ The term “extremely likely” is defined as having a ninety five percent or greater probability. Thus, the IPCC’s research indicates that the planet is warming and scientists are ninety five percent sure that human activities are the cause.

Increased temperatures have been linked to major environmental changes, with the IPCC concluding that it is “very likely”³⁶⁵ that warming has led to increased sea levels, reduced

snow and ice cover, and altered precipitation patterns.³⁶⁶ These changes have, in turn, been linked with increased species extinction. Research by the IPCC indicates that climate change will affect the number and size of species' populations, including by eliminating essential habitat, disrupting breeding and other critical life stages, and increasing susceptibility to disease and other forms of mortality.³⁶⁷

This scientific evidence leaves little doubt that greenhouse gas emissions adversely affect species and their habitats. Recognizing this, several experts have argued that federal agencies should be required to consult on greenhouse gas emitting-actions. In this regard, Kostyack and Rohlf assert that consultation should be undertaken for any action that results in "non-trivial net increases" in greenhouse gases.³⁶⁸ Similarly, Cummings and Siegel contend that any action that "contributes an appreciable amount of [greenhouse gas] emissions to the atmosphere...should undergo the consultation process."³⁶⁹ According to the authors, this may include the establishment of fuel efficiency standards for motor vehicles, the approval of new coal-fired power plants, and the leasing of offshore areas for oil and gas development.³⁷⁰

FINDING 23

The DOI could require federal agencies to consult on all greenhouse gas emitting-activities to ensure that they do not jeopardize any listed species or result in the destruction or adverse modification of any critical habitat.

FWS could work with federal agencies to assess the impact of greenhouse gas emitting-actions on endangered and threatened species and their critical habitat. This is likely to have a number of benefits, increasing awareness of the impacts of climate change on ecosystems and thereby encouraging more climate-sensitive decision-making by federal agencies.

Adopting this approach, FWS may find that actions emitting greenhouse gases and/or otherwise contributing to climate change jeopardize listed species. Where such a finding is made, FWS may require the action to be modified or cancelled to avoid the jeopardy.

As discussed above, ESA, section 7(a)(2) (16 U.S.C. § 1536(a)(2)) requires federal agencies to ensure, through consultation with FWS, that their actions are "not likely to jeopardize the continued existence of any" listed species. Under ESA, section 7(b)(3)(A) (16 U.S.C. § 1536(b)(3)(A)), FWS must, after consulting with the relevant agency, produce a biological opinion outlining its conclusions on the likely effect of the action. If the biological opinion concludes that the action will jeopardize a listed species or modify its critical habitat, FWS must suggest reasonable and prudent alternatives the agency can take to avoid such impact.³⁷¹ If the agency refuses to adopt these alternatives, the action can be enjoined.

The ESA's implementing regulations define "jeopardize" to mean "engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species."³⁷² As

discussed above, there is significant evidence that climate change alters ecosystems to the detriment of resident species. Relevantly, research suggests that climate change will adversely affect some species' reproductive success, leading to a reduction in their numbers.³⁷³ Moreover, climate change will also alter the distribution of species and, in particular, result in the disappearance of northern hemisphere species from the southern portions and lower elevations of their ranges.³⁷⁴ In these circumstances, there is a good argument that federal actions emitting greenhouse gases and/or otherwise contributing to climate change jeopardize species and their habitats.

FINDING 24

FWS could determine that federal agency actions emitting greenhouse gases and/or otherwise contributing to climate change jeopardize listed species and require such actions to be modified or cancelled to avoid the jeopardy.

Greenhouse gas-emitting activities may also be enjoined under ESA, section 9 (16 U.S.C. § 1538). ESA, section 9(a)(1)(B)-(C) (16 U.S.C. § 1538(a)(1)(B)-(C)) makes it unlawful for any person to "take" an endangered species of fish or wildlife within the U.S., its territorial seas, or the high seas (the "**take prohibition**"). Under ESA, section 4(d) (16 U.S.C. § 1533(d)), the Secretary of the Interior may, by regulation, apply the take prohibition to threatened species of fish and wildlife. Regulations adopted pursuant to this section apply the take prohibition to all threatened species, unless the Secretary of the Interior is-

sues a special rule limiting its application.³⁷⁵ The prohibition applies to both federal and private actors.³⁷⁶

The legislative history indicates that Congress intended the take prohibition to have the "broadest possible" meaning and to apply to "every conceivable way in which a person can "take" or attempt to "take" any endangered species."³⁷⁷ To this end, ESA, section 3(19) (16 U.S.C. § 1532(19)) defines "take" broadly to mean "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."³⁷⁸ Regulations implementing the ESA (16 U.S.C. § 1531 et seq.) define "harm" to include "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering."³⁷⁹ This definition was upheld by the U.S. Supreme Court in *Babbitt v. Sweet Home Chapter of Cmty. for a Great Or.*, 515 U.S. 687 (1995). There, the court held that the word "take", and its constituent parts, should be construed broadly to include actions affecting listed species both directly and indirectly.³⁸⁰

FWS has not issued any formal guidance on the application of the take prohibition to activities that emit greenhouse gases and/or otherwise contribute to climate change. However, in 2009, then-Secretary of the Interior Ken Salazar asserted that using the take prohibition to control greenhouse gas emissions "is not the right way to go."³⁸¹ Consistent with this view, FWS has, to date, refused to prosecute greenhouse gas emitters for "taking" listed species affected by climate change. After listing the

polar bear as a threatened species, FWS issued a special rule providing that any incidental take³⁸² of polar bears caused by activities that occur outside of the bears' range is not subject to the take prohibition.³⁸³ This includes activities resulting in greenhouse gas emissions that cause climate change. In support of this rule, FWS emphasized that it is not currently possible to link the greenhouse gas emissions from a particular source to affects on a particular bear.³⁸⁴

As discussed above, there is significant and growing scientific evidence that human activities contributing to climate change have, and will continue to, alter environmental conditions to the detriment of fish and wildlife. By way of example, research by the IPCC indicates that anthropogenic greenhouse gas emissions are "extremely likely" to have increased global temperatures³⁸⁵ which are, in turn, "very likely" to have reduced the thickness and extent of sea ice.³⁸⁶ Sea ice forms part of the habitat of several Arctic animals, including the threatened polar bear which uses ice for hunting, breeding, and migration.³⁸⁷ The decline in sea ice caused by climate change will alter the polar bears' habitat and thereby interfere with its feeding. In this regard, FWS has warned that the availability of ice seals – the polar bears' primary food source – will be adversely affected by the projected loss of sea ice.³⁸⁸ According to FWS, this will "cause declines in the condition of polar bears from nutritional stress...[leading to] reductions in survival."³⁸⁹

Given the above, there is a good argument that greenhouse gas emitting-activities "harm" listed species and therefore contravene the take

prohibition in section 9 of the ESA (16 U.S.C. § 1538). This view is shared by a number of environmental law scholars. For example, Morath relies on IPCC reports and other scientific evidence to show that greenhouse gas emissions contribute to global warming which destroys polar bear habitat and thereby injures the species.³⁹⁰ In these circumstances, Morath argues that the take prohibition "may provide a viable basis for a claim against" emitters.³⁹¹ Similarly, Sommer also argues that the take prohibition may be used to prevent or limit activities that indirectly affect listed species by, for example, contributing to climate change.³⁹²

Notwithstanding this, some scholars have expressed concern that the many sources of greenhouse gas emissions and the lack of any mechanism for tracing emissions from each source may make it difficult to prove that an individual emitter is causing climate change harm.³⁹³ There is no case law analyzing whether a greenhouse gas emitter can be found to be a legal cause of injuries suffered by listed species as a result of climate change. However, previous court cases discussing the causes of climate change provide useful guidance on this issue.

In *Massachusetts v. Environmental Protection Agency*, 549 U.S. 497 (2007), a majority of the U.S. Supreme Court held that EPA's failure to regulate greenhouse gas emissions from new motor vehicles under the Clean Air Act (42 U.S.C. § 7401 et seq.) is a cause of global warming and associated sea level rise that poses a risk of harm to coastal land in Massachusetts. In doing so, the majority rejected EPA's argument that its decision not to

regulate automobile emissions makes an insignificant contribution to the climate change injuries suffered by Massachusetts.³⁹⁴ The majority found that U.S. motor vehicles make a “meaningful contribution” to climate change, noting that they account for six percent of annual, global carbon dioxide emissions.³⁹⁵

The Supreme Court’s decision in *Massachusetts v. Environmental Protection Agency*, 549 U.S. 497 (2007) supports the view that greenhouse gas emitters can be held liable for harm to listed species as a result of climate change, particularly where they account for a significant share of global emissions. As one commentator has observed, following the decision, “courts will consider an action that emits 6 percent of annual, global carbon dioxide emissions a legal cause of injuries related to climate change.”³⁹⁶ In addition, the courts may also conclude that other actions, accounting for less than six percent of global greenhouse gas emissions, make a meaningful contribution to climate change and, as such, cause injuries.

Consistent with this view, several environmental law scholars have suggested that actions accounting for a large share of domestic greenhouse gas emissions may be found to cause climate change harm.³⁹⁷ In this regard, Peel has noted that, “[a]lthough the emission of GHGs gives rise to global environmental effects, it does not necessarily follow that the only, or even the most appropriate, scale for assessment of impacts...is a global one.”³⁹⁸ Rather, the courts should view climate change as a “multiscalar” problem that affects environments at the local, regional, national, and

international levels.³⁹⁹ Adopting this approach, actions which make only a small contribution to the global greenhouse gas inventory may nonetheless be found to cause climate change injuries if they have significant local, regional, or national impacts.⁴⁰⁰

Given the above, FWS may validly conclude that activities making a significant contribution to climate change breach the take prohibition in section 9 of the ESA (16 U.S.C. § 1538). FWS, in cooperation with the Department of Justice, could bring court proceedings to enjoin such activities. Alternatively, proceedings may be brought by private parties under ESA, section 11(g) (15 U.S.C. § 1540(g)).⁴⁰¹

FINDING 25

FWS may determine that actions emitting significant greenhouse gases harm listed species and therefore contravene the take prohibition in section 9 of the ESA (16 U.S.C. § 1538).

8. CONCLUSION

There is now almost universal agreement among scientists that anthropogenic greenhouse gas emissions alter climatic conditions, leading to higher air and water temperatures, reduced snow and ice cover, rising sea levels, and more frequent and severe droughts, floods, and other extreme weather events.⁴⁰² Recognizing the threat posed by global climate change, the Obama Administration has urged Congress to enact legislation controlling greenhouse gas emissions.⁴⁰³ In the absence of Congressional action, President Obama has committed to using existing executive powers to reduce emissions.⁴⁰⁴

In June 2013, the President adopted a new Climate Action Plan, directing executive agencies to implement climate change mitigation strategies.⁴⁰⁵ The Climate Action Plan requires agencies to, among other things, establish carbon pollution standards for new and existing power plants, increase the energy efficiency of buildings and appliances, adopt fuel economy standards for heavy duty vehicles, support the development of renewable fuels and other low-carbon energy and transportation options, and conserve forests to increase carbon sequestration.⁴⁰⁶ Among the executive agencies charged with implementing the President's Climate Action Plan is the DOI.

The DOI administers much of the nation's land, mineral, and other natural resources. The DOI manages approximately 500 million acres of land, representing one-fifth of the total area of the U.S.⁴⁰⁷ In its role as land manager, the DOI oversees the development of over twenty

percent of U.S. energy supplies⁴⁰⁸ and provides almost fifteen percent of the hydroelectric power used nationally.⁴⁰⁹ In addition, the DOI is also responsible for conserving fish and wildlife, including almost 2,000 listed threatened and endangered species⁴¹⁰ and protecting over 400 national parks, monuments, and other reservations.⁴¹¹

The development and use of DOI-administered land and other resources currently emits greenhouse gases and limits carbon sequestration, both of which contribute to climate change. However, in the future, these resources may be used in ways that reduce emissions and increase sequestration.

In an attempt to accelerate this transition to clean development, the DOI has recently implemented climate change mitigation strategies. The DOI has sought to reduce greenhouse gas emissions by supporting the development of clean energy alternatives to carbon-intensive fossil fuels. To this end, the DOI has permitted wind, solar, and geothermal projects on BLM Lands⁴¹² and expanded hydroelectric generation at federal dams.⁴¹³ To offset the remaining emissions, the DOI has increased carbon sequestration by protecting and expanding tree cover in national parks and other areas.⁴¹⁴

Building on these efforts, the DOI can take additional steps to mitigate climate change. The DOI could:

- **Reduce Greenhouse Gas Emissions Related to Oil and Gas.** The DOI could reduce greenhouse gas emissions from oil and gas production, transportation, and use by requiring oil and gas companies to report on

the climate impacts of their operations and to take appropriate steps to minimize those impacts.

- **Use Plants and Soil to Store Carbon.** The DOI can focus its management of BLM Lands to enhance their ability to store carbon dioxide in plants and soils.
- **Use BLM Lands for Underground Carbon Sequestration.** The DOI can actively promote the use of BLM Lands for geologic carbon sequestration and storage projects and encourage the development of pilot projects.
- **Encourage the Development of More Renewable Power and More Transmission for Renewables.** The DOI can encourage more development of renewable energy facilities on BLM Lands by approving further reductions in the rents and fees charged to renewable energy producers and preventing the speculative stockpiling of renewable energy sites. In addition, it can work with other federal agencies to streamline the permitting process for electric transmission projects on BLM Lands.
- **Build More Hydroelectric Capacity.** The DOI can expand hydroelectric generation by investing in new or upgraded power plants on existing federal dams and other water infrastructure.
- **Increase the Use of National Parks and Monuments to Improve Public Understanding of Climate Challenges and Solutions.**

The DOI can undertake additional research on the impact of climate variations on national parks and options for mitigating those impacts, and increase the use of national parks to demonstrate and point to promising solutions.

- **Reduce Greenhouse Gases to Avoid the Extinction of Animals and Plants.** The DOI can require that all future threatened and endangered species listing decisions include consideration of the impacts of climate change on individual species, and require that federal agencies consult with FWS. FWS could determine that federal agency actions emitting greenhouse gases, and/or otherwise contributing to climate change, jeopardize listed species. Where such a determination is made, FWS could require that the action be modified or cancelled to avoid the jeopardy. Additionally, FWS could also enjoin non-federal actions contributing to climate change on the basis that such actions result in the taking of listed species.



Courtesy of Etienne Le Sueur.

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- ¹² *Id.* at 17 (finding that “[w]ater quality and water supply reliability are jeopardized by climate change”).
- ¹³ *Id.* at 40 (indicating that climate change will likely increase the risk of floods and droughts).
- ¹⁴ *Id.* at 41 (indicating that “[h]urricane-associated storm intensity and rainfall rates are projected to increase as the climate continues to warm”).
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- ⁹³ *Id.* at 3.
- ⁹⁴ As discussed above, NEPA, section 102(2)(C) (42 U.S.C. § 4332(2)(C)) requires federal agencies to undertake an environmental assessment, and prepare an EIS, for all "major federal actions significantly affecting the quality of the human environment. 40 C.F.R. § 1508.15 defines a "major federal action" to include "actions with effects that may be major and which are potentially subject to Federal control and responsibility." Under 40 C.F.R. § 1508.15, an action is considered to be "subject to Federal control" if it is undertaken by a federal agency or by a private party with the consent of a federal agency. Therefore, as oil and gas development on the outer continental shelf requires BOEM approval, it is a "federal action" for the purposes of NEPA (42 U.S.C. § 4321 et seq.).
- ⁹⁵ U.S. Department of the Interior Bureau of Ocean Energy Management, Environmental Stewardship (last visited May 23, 2014), <http://www.boem.gov/Environmental-Stewardship/>.
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- ⁹⁸ *Id.* at 4-201, 4-212, 4-224.
- ⁹⁹ *Id.* at 4-200, 4-201, 4-211, 4-223.
- ¹⁰⁰ 43 C.F.R. § 3101.1-3 (2014) (authorizing BLM to attach stipulations to permits for oil and gas development). See also 43 C.F.R. § 3101.1-2 (2014) (requiring the holder of a permit for oil and gas development to undertake such development “subject to stipulations attached to the” permit).
- ¹⁰¹ Mineral Leasing Act § 28(f); 30 U.S.C. § 185(f) (2014) (authorizing BLM to attach to rights-of-way “terms and conditions...regarding extent, duration, survey, location, construction, operation, maintenance, use, and termination”).
- ¹⁰² U.S. ENVIRONMENTAL PROTECTION AGENCY, *supra* note 4, at ES-5 – ES-7.
- ¹⁰³ *Id.* at ES-5 – ES-7 (indicating that natural gas systems emitted 127.1 million metric tons of methane in 2012 and petroleum systems emitted 31.7 million metric tons of methane in 2012).
- ¹⁰⁴ ALVAREZ ET AL., *supra* note 54, at 1.
- ¹⁰⁵ *Id.*
- ¹⁰⁶ After a well is drilled and completed, it is standard practice to flow the well to remove debris from the wellbore. This is referred to as “wellbore cleanup”. Ordinarily, during wellbore cleanup, liquid hydrocarbons are moved to an open pit or tank and associated methane gas is sent to a gas vent or flare. In a reduced emission or green completion, processing equipment is used to separate and recover gas and gas condensate for sale. SUSAN HARVEY, VIGNESH GOWRISHANKAR, AND THOMAS SINGER, LEAKING PROFITS: THE U.S. OIL AND GAS INDUSTRY CAN REDUCE POLLUTION, CONSERVE RESOURCES, AND MAKE MONEY BY PREVENTING METHANE WASTE, 18 - 19 (2012), available at <http://www.nrdc.org/energy/files/Leaking-Profits-Report.pdf>.
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- ¹⁰⁸ U.S. ENVIRONMENTAL PROTECTION AGENCY, WELL COMPLETIONS, *supra* note 64, at 27 – 29.
- ¹⁰⁹ HARVEY ET AL., *supra* note 106, at 23 - 25. See also U.S. ENVIRONMENTAL PROTECTION AGENCY, LIQUIDS UNLOADING, *supra* note 64, at 20 – 23.
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- ¹¹¹ U.S. ENVIRONMENTAL PROTECTION AGENCY, COMPRESSORS, *supra* note 64, at 39 – 42.
- ¹¹² *Id.* at 29 – 34.
- ¹¹³ HARVEY ET AL., *supra* note 106, at 34 - 36. See also U.S. ENVIRONMENTAL PROTECTION AGENCY, PNEUMATIC DEVICES, *supra* note 64, at 41 – 44.
- ¹¹⁴ HARVEY ET AL., *supra* note 106, at 42 - 44. See also U.S. ENVIRONMENTAL PROTECTION AGENCY, LEAKS, *supra* note 64, at 36 – 54.

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- ¹¹⁶ HARVEY ET AL., *supra* note 106, at 5.
- ¹¹⁷ Onshore Oil and Gas Order 9: Waste Prevention and Use of Produced Oil and Gas for Beneficial Purposes (Fall 2009), *available at* <http://www.reginfo.gov/public/do/eAgendaViewRule?pubId=200910&RIN=1004-AE14>.
- ¹¹⁸ *Id.*
- ¹¹⁹ THE WHITE HOUSE, *supra* note 63, at 9.
- ¹²⁰ 5 C.C.R. § 1001-9 (2014).
- ¹²¹ *Id.*
- ¹²² *Id.*
- ¹²³ JAMES BRADBURY, MICHAEL OBEITER, LAURA DRAUCKER, WEN WANG, AND AMANDA STEVENS, CLEARING THE AIR: REDUCING UPSTREAM GREENHOUSE GAS EMISSIONS FROM U.S. NATURAL GAS SYSTEMS, WORLD RESOURCES INSTITUTE WORKING PAPER, 14 (2013), *available at* <http://www.wri.org/publication/clearing-the-air>.
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- ¹²⁶ *Id.*
- ¹²⁷ U.S. ENVIRONMENTAL PROTECTION AGENCY, *supra* note 4, at ES-5 – ES-7.
- ¹²⁸ *Id.* at ES-12.
- ¹²⁹ Ottmar Edenhofer, Ramón Pichs-Madruga, Youba Sokona, Kristin Seyboth, Dan Arvizu, Thomas Bruckner, John Christensen, Helena Chum, Jean-Michel Devernay, Andre Faaij, Manfred Fischedick, Barry Goldstein, Gerrit Hansen, John Huckerby, Arnulf Jäger-Waldau, Susanne Kadner, Daniel Kammen, Volker Krey, Arun Kumar, Anthony Lewis, Oswaldo Lucon, Patrick Matschoss, Lourdes Maurice, Catherine Mitchell, William Moomaw, José Moreira, Alain Nadai, Lars J. Nilsson, John Nyboer, Atiq Rahman, Jayant Sathaye, Janet Sawin, Roberto Schaeffer, Tormod Schei, Steffen Schlömer, Ralph Sims, Christoph von Stechow, Aviel Verbruggen, Kevin Urama, Ryan Wiser, Francis Yamba, & Timm Zwickel, *Summary for Policymakers*, in RENEWABLE ENERGY SOURCES AND CLIMATE CHANGE MITIGATION 3, 19 (Ottmar Edenhofer, Ramón Pichs-Madruga, Youba Sokona, Kristin Seyboth, Patrick Matschoss, Susanne Kadner, Timm Zwickel, Patrick Eickemeier, Gerrit Hansen, Steffen Schlömer, and Christoph von Stechow eds., 2011), *available at* <http://srren.ipcc-wg3.de/report> (estimating that, on a lifecycle basis, renewable power systems emit forty six grams of carbon dioxide equivalent per kilowatt hour of electricity generated and fossil fuel power plants emit between 469 and 1001 grams of carbon dioxide equivalent per kilowatt hour (“**KWh**”) of electricity generated).

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- ¹⁴⁸ Department of the Interior Bureau of Land Management, Renewable Energy Projects Approved Since the Beginning of Calendar Year 2009 (last updated May 8, 2014), http://www.blm.gov/wo/st/en/prog/energy/renewable_energy/Renewable_Energy_Projects_Approved_to_Date.html.
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- ¹⁵² ERIC T. SUNDQUIST, KATHERINE V. ACKERMAN, NORMAN B. BLISS, JOSEPH M. KELLNDORFER, MATT C. REEVES, AND MATTHEW G. ROLLINS, U.S. GEOLOGICAL SURVEY, RAPID ASSESSMENT OF U.S. FOREST AND SOIL ORGANIC CARBON STORAGE AND FOREST BIOMASS CARBON SEQUESTRATION POTENTIAL, 13 (2009), available at <http://pubs.usgs.gov/of/2009/1283/> (finding that, at present, 3.48 billion metric tons of carbon is stored in soils and 0.81 billion metric tons of carbon is stored in forest biomass on DOI-managed lands and that, in the future, an additional 0.84 to 1.24 billion metric tons of carbon could be stored in biomass on DOI-managed lands).
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- ¹⁵⁷ U.S. DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT, SOLAR 2010 – 2015 PER ACRE BASE RENT SCHEDULE (2010), available at <http://www.blm.gov/wo/st/en/prog/more/lands.html>.
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- ¹⁶⁵ U.S. Environmental Protection Agency, *Clean Energy: Coal* (last updated Sep. 25, 2013), <http://www.epa.gov/cleanenergy/energy-and-you/affect/coal.html> (estimating average emissions of carbon dioxide from coal-fired generation at 2,249 pounds per MWh); U.S. Environmental Protection Agency, *Clean Energy: Oil* (last updated Sep. 25, 2013), <http://www.epa.gov/cleanenergy/energy-and-you/affect/oil.html> (estimating average emissions of carbon dioxide from oil-fired generation at 1,672 pounds per MWh); U.S. Environmental Protection Agency, *Clean Energy: Natural Gas* (last updated Sep. 25, 2013), <http://www.epa.gov/cleanenergy/energy-and-you/affect/natural-gas.html> (estimating average emissions of carbon dioxide from natural gas-fired generation at 1,135 pounds per MWh).
- ¹⁶⁶ Jeremy Knee, *Rational Electricity Regulation: Environmental Impacts and the "Public Interest"* 113 W. VA. L. REV. 739, Footnote 20 (2011) (referring to estimates prepared by the U.S. Department of Energy).
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- ¹⁶⁸ Geothermal Steam Act § 5(a)(3)(A)(ii); 30 U.S.C. § 1004(a)(3)(A)(ii) (2014).
- ¹⁶⁹ Geothermal Steam Act § 5(a)(3)(A)(i); 30 U.S.C. § 1004(a)(3)(A)(i) (2014).
- ¹⁷⁰ Geothermal Steam Act § 5(a)(3)(B); 30 U.S.C. § 1004(a)(3)(B) (2014).
- ¹⁷¹ Geothermal Steam Act § 5(a)(1)(A), 30 U.S.C. § 1004(a)(1)(A) (2014). See also 45 C.F.R. § 3211.17(a) (2014). This royalty rate applies to leases issued on or after August 8, 2005. For earlier leases, the royalty rate varies on a case-by-case basis.
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- ¹⁷³ Geothermal Energy Association, *GEA Policy Priorities for 2013* (last visited Apr. 8, 2014), <http://www.geo-energy.org/priorities.aspx> (stating that "for the past few years, the geothermal energy industry has grown steadily, but slowly").

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- ¹⁷⁸ 43 C.F.R. § 2804.23(c) (2014).
- ¹⁷⁹ Advance Notice of Proposed Rulemaking Regarding a Competitive Process for Leasing Public Lands for Solar and Wind Energy Development, 76 Fed. Reg. 81906 (Dec. 29, 2011).
- ¹⁸⁰ The 2012 Unified Agenda of Federal Regulatory and Deregulatory Actions indicates that BLM is in the process of preparing a rule to establish a competitive process for leasing BLM Lands for solar and wind energy development. Introduction to the Unified Agenda of Federal Regulatory and Deregulatory Action, 78 Fed. Reg. 1317 (Jan. 3, 2013).
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- ¹⁸² U.S. DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT, APPROVED RESOURCE MANAGEMENT PLAN AMENDMENTS / RECORD OF DECISION (ROD) FOR SOLAR ENERGY DEVELOPMENT IN SIX SOUTHWESTERN STATES (2012), *available at* <http://blmsolar.anl.gov/program/>.
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- ¹⁸⁵ *Id.*
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- ¹⁸⁷ *Id.*
- ¹⁸⁸ LETHA TAWNEY, RUTH GREENSPAN BELL, AND MICAH S. ZIEGLER, HIGH WIRE ACT: ELECTRICITY TRANSMISSION INFRASTRUCTURE AND ITS IMPACT ON THE RENEWABLE ENERGY MARKET, WORLD RESOURCES INSTITUTE REPORT 6 (2011), *available at* <http://www.wri.org/publication/high-wire-act> (noting that high quality renewable resources “are often distant from electricity markets”). See also ENERNEX CORPORATION, EASTERN WIND INTEGRATION AND TRANSMISSION STUDY: PREPARED FOR THE NATIONAL RENEWABLE ENERGY LABORATORY, 29 (2011) *available at*

http://www.nrel.gov/electricity/transmission/eastern_renewable.html (finding that wind resources in the remote Great Plains region have capacity factors up to nine percent higher than those close to urban areas).

- ¹⁸⁹ TAWNEY ET AL., *supra* note 188, at 6 (indicating that renewable energy sources, such as wind and solar energy, are location bound).
- ¹⁹⁰ *Id.* (concluding that many areas with high renewable energy potential “are currently inaccessible because of transmission constraints”). See also DEPARTMENT OF THE INTERIOR ET AL., *supra* note 130, at 14 (indicating that “wind energy projects may be challenged by the need to connect to the energy transmission grid... In addition to wind development, solar and geothermal projects may require new or significant upgrades to the existing transmission grid”).
- ¹⁹¹ NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION, 2009 SCENARIO RELIABILITY ASSESSMENT (2009), available at http://www.nerc.com/files/2009_Scenario_Assessment.pdf.
- ¹⁹² Memorandum from Steven Chu, Secretary of Energy, to the Power Marketing Administrators (Mar. 16, 2012), available at <http://energy.gov/downloads/memorandum-secretary-chu-power-marketing-administrations-role-march-16-2012>.
- ¹⁹³ Memorandum of Understanding between the U.S. Department of Agriculture, Department of Commerce, Department of Defense, Department of Energy, Department of Interior, Environmental Protection Agency, the Council on Environmental Quality, the Federal Energy Regulatory Commission, and the Advisory Council on Historic Preservation on Coordination in Federal Agency Review of Electric Transmission Facilities on Federal Land (Oct. 23, 2009), available at <http://energy.gov/sites/prod/files/Transmission%20Siting%20on%20Federal%20Lands%20MOU%20October%2023%2C%202009.pdf>.
- ¹⁹⁴ *Id.* at 1.
- ¹⁹⁵ *Id.*
- ¹⁹⁶ White House Council on Environmental Quality, Interagency Rapid Response Team for Transmission (last visited Apr. 2, 2014), <http://www.whitehouse.gov/administration/eop/ceq/initiatives/interagency-rapid-response-team-for-transmission>.
- ¹⁹⁷ *Id.*
- ¹⁹⁸ *Id.*
- ¹⁹⁹ Corridors may also be designated for oil, gas, and hydrogen pipelines and electricity distribution facilities. See Energy Policy Act § 358(a), 42 U.S.C. § 15926(a) (2014).
- ²⁰⁰ BUREAU OF LAND MANAGEMENT, APPROVED RESOURCE MANAGEMENT PLAN AMENDMENTS: RECORD OF DECISION (ROD) FOR DESIGNATION OF ENERGY CORRIDORS ON BUREAU OF LAND MANAGEMENT-ADMINISTERED LANDS IN THE 11 WESTERN STATES (2009), available at http://corridoreis.anl.gov/documents/docs/Energy_Corridors_final_signed_ROD_1_14_2009.pdf.
- ²⁰¹ ENERNEX CORPORATION, *supra* note 188, at 29.
- ²⁰² As discussed above, Energy Policy Act, section 368(c)(2) (42 U.S.C. § 15926(c)(2)) requires the Secretary of the Interior to expedite applications to construct or modify electricity transmission facilities within energy corridors.

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- ²⁰⁴ ADAM VANN, ENERGY PROJECTS ON FEDERAL LANDS: LEASING AND AUTHORIZATION, 3 (2012), available at <http://fas.org/sgp/crs/misc/R40806.pdf>.
- ²⁰⁵ 40 C.F.R. § 1508.18 defines a “major federal action” to include “actions with effects that may be major and which are potentially subject to Federal control and responsibility.” 40 C.F.R. § 1508.18(a) defines the term “action” to include the adoption of “new or revised agency rules, regulations, plans, policies or procedures.” This is further elaborated in 40 C.F.R. § 1508.18(b)(2) which identifies the “adoption of formal plans, such as official documents prepared...by federal agencies which guide or prescribe alternative uses of Federal resources, upon which future agency actions will be based” as an example of a “federal action.” Resource management plans are official documents prepared by, and binding on, BLM (i.e., a federal agency). The adoption of those plans is therefore a “federal action” for the purposes of NEPA (42 U.S.C. § 4321 et seq.). Similarly, issuance of a permit authorizing the use of BLM Lands in accordance with a resource management plan is also a “federal action” under NEPA (42 U.S.C. § 4321 et seq.). Under 40 C.F.R. § 1508.18(b)(4), the term “federal action” is defined to include the “approval of specific projects.” Therefore, as the construction of transmission facilities on BLM Lands requires DOI approval, it is a “federal action” under NEPA (42 U.S.C. § 4321 et seq.).
- ²⁰⁶ U.S. DEPARTMENT OF ENERGY AND U.S. DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT, PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT: DESIGNATION OF ENERGY CORRIDORS ON FEDERAL LAND IN THE 11 WESTERN STATES (DOE/EIS-0386) (2008), available at <http://corridoreis.anl.gov/eis/guide/index.cfm>.
- ²⁰⁷ Gorte, *supra* note 16, at 2.
- ²⁰⁸ *Id.* at 4-5.
- ²⁰⁹ *Id.* at 5.
- ²¹⁰ Ross W. Gorte, *U.S. Tree Planting for Carbon Sequestration*, CONGRESSIONAL RESEARCH SERVICE REPORT FOR CONGRESS R40562, 1-2 (2009).
- ²¹¹ Gorte, *supra* note 16, at 9.
- ²¹² *Id.* at 8.
- ²¹³ *Id.* at 12.
- ²¹⁴ *Id.* 13.
- ²¹⁵ Paul Schroeder, *Can Intensive Management Increase Carbon Storage in Forests?* 15 ENVTL. MGMT. 475, 477 (1991).
- ²¹⁶ U.S. Department of Agriculture Pacific Northwest Research Station, *Bioenergy from Trees: Using Cost-Effective Thinning to Reduce Forest Fire Hazards*, 117 SCIENCE FINDINGS 1 (2009).
- ²¹⁷ U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE, WOODY BIOMASS UTILIZATION STRATEGY, 1 (2008), available at <http://www.fs.fed.us/woodybiomass/strategy/index.shtml>.
- ²¹⁸ *Id.*
- ²¹⁹ SUNDQUIST ET AL., *supra* note 152, at 13 (indicating that 3.48 billion metric tons of carbon is currently stored in soils on land managed by the DOI).

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- ²²⁰ *Id.* (indicating that 0.81 billion metric tons of carbon is currently stored in biomass on land managed by the DOI).
- ²²¹ *Id.* (indicating that an additional 0.84 to 1.24 billion metric tons of carbon could be stored in biomass on land managed by the DOI in the future).
- ²²² U.S. ENVIRONMENTAL PROTECTION AGENCY, *supra* note 4, at ES-5 – ES-7 (indicating that 6,5015 million metric tons of carbon dioxide equivalent was emitted in the U.S. in 2012).
- ²²³ U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE, CLIMATE CHANGE RESPONSE PROGRAM: MITIGATION BRIEF, 2 (2013), available at <http://www.nps.gov/subjects/climatechange/resources.htm>.
- ²²⁴ U.S. DEPARTMENT OF THE INTERIOR, CARBON STORAGE PROJECT, 16 (2009), available at http://www.doi.gov/whatwedo/climate/cop15/upload/CO2_PowerPoint_-2.pdf.
- ²²⁵ Clean Air Act § 401(b)(1); 42 U.S.C. § 7401(b)(1) (2014) (indicating that the purposes of the Clean Air Act are to, among other things, “protect and enhance the quality of the Nation’s air resources so as to promote public health and welfare and the productive capacity of its population”).
- ²²⁶ Walsh et al., *supra* note 8, at 40.
- ²²⁷ *Id.*
- ²²⁸ U.S. Department of the Interior Bureau of Land Management, Frequently Asked Questions: What is an RMP? (last updated Apr. 7, 2011), http://www.blm.gov/wo/st/en/prog/planning/planning_overview/frequently_asked_questions.html#3.
- ²²⁹ U.S. Department of the Interior Bureau of Land Management, Frequently Asked Questions: Does any Action Taken on BLM Land Need to be Consistent With a Plan? (last updated Apr. 7, 2011), http://www.blm.gov/wo/st/en/prog/planning/planning_overview/frequently_asked_questions.html#5.
- ²³¹ *Id.* at 24-25.
- ²³² The Secretary of the Interior, Order No. 3330, Improving Mitigation Policies and Practices of the Department of the Interior (Oct. 31, 2013).
- ²³³ JOEL P. CLEMENT, ALLETTA D’A. BELIN, MICHAEL J. BEAN, TED. A. BOLING, AND JAMES R. LYONS, A STRATEGY FOR IMPROVING THE MITIGATION POLICIES AND PRACTICES OF THE DEPARTMENT OF THE INTERIOR: A REPORT TO THE SECRETARY OF THE INTERIOR FROM THE ENERGY AND CLIMATE CHANGE TASK FORCE, 9 (2014), available at http://www.doi.gov/news/upload/Mitigation-Report-to-the-Secretary_FINAL_04_08_14.pdf (indicating that the strategy “advances ongoing efforts at the Department to embrace a landscape-scale approach to managing natural and cultural resources”).
- ²³⁴ For the purposes of the strategy, a “landscape” is defined as “a large area encompassing an interacting mosaic of ecosystems and human systems that is characterized by a common set of management concerns.” *Id.*
- ²³⁵ *Id.* at 10
- ²³⁶ *Id.*
- ²³⁷ U.S. GEOLOGICAL SURVEY, *supra* note 153, at 2 (indicating that 2,300 to 3,700 billion metric tons of carbon dioxide could be stored in underground geological formations).

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- ²³⁸ 43 C.F.R. § 2920.1-1 (2014).
- ²³⁹ CHRISTOPHER S. GALIK, JOSEPH L. GRINNELL, AND DAVID M. COOLEY, THE ROLE OF PUBLIC LANDS IN A LOW-CARBON ECONOMY, 5 (2010), *available at* http://www.nicholas.duke.edu/ccpp/ccpp_pdfs/public.lands.03.18.10.pdf (indicating that “no laws yet exist that specifically and directly govern geologic [carbon dioxide] storage on federal lands”); U.S. DEPARTMENT OF THE INTERIOR, REPORT TO CONGRESS: FRAMEWORK FOR GEOLOGICAL CARBON SEQUESTRATION ON PUBLIC LAND, 7 (2009), *available at* [http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS_REALTY_AND_RESOURCE_PROTECTION_/energy.Par.39184.File.dat/Framework for Geological Carbon Sequestration on Public Land.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS_REALTY_AND_RESOURCE_PROTECTION_/energy.Par.39184.File.dat/Framework%20for%20Geological%20Carbon%20Sequestration%20on%20Public%20Land.pdf) (stating “there is no specific statutory authority for leasing public land or an interest in public land for the long-term sequestration of” carbon dioxide).
- ²⁴⁰ U.S. DEPARTMENT OF THE INTERIOR, *supra* note 239, at 9.
- ²⁴¹ *Id.* at 10 (stating that “[t]he BLM’s Resource Management Plans (RMP) form the basis for every action and approved use on the public lands...Where sequestration activities are proposed, plan amendments will be needed to identify the suitability of public lands within the planning area, analyze environmental impacts as part of the NEPA process, protect or mitigate damage to other surface or subsurface [natural or cultural] resources...and provide for public review and comment.”).
- ²⁴² *Id.*
- ²⁴³ GOVERNMENT ACCOUNTABILITY OFFICE, *supra* note 142, at 23 (concluding that it is inefficient to amend resource management plans on a case-by-case basis).
- ²⁴⁴ Memorandum on a Comprehensive Federal Strategy on Carbon Capture and Storage, 75 Fed. Reg. 6,087 (Feb. 3, 2010) (establishing an interagency taskforce to develop a plan to overcome financial, economic, technological, legal, institutional, social, and other barriers to the widespread, cost-effective deployment of carbon capture and storage technology).
- ²⁴⁵ BUREAU OF LAND MANAGEMENT, IMPLEMENTATION OF A WIND ENERGY DEVELOPMENT PROGRAM AND ASSOCIATED LAND USE PLAN AMENDMENTS (2005), *available at* <http://windeis.anl.gov/documents/docs/WindPEISROD.pdf>.
- ²⁴⁶ BUREAU OF LAND MANAGEMENT, APPROVED RESOURCE MANAGEMENT PLAN AMENDMENTS / RECORD OF DECISION (ROD) FOR SOLAR ENERGY DEVELOPMENT IN SIX SOUTHWESTERN STATES (2012), *available at* [http://blmsolar.anl.gov/documents/docs/peis/Solar PEIS ROD.pdf](http://blmsolar.anl.gov/documents/docs/peis/Solar%20PEIS%20ROD.pdf).
- ²⁴⁷ U.S. ENVIRONMENTAL PROTECTION AGENCY, *supra* note 4, at ES-5 – ES-7.
- ²⁴⁸ Conventional hydropower refers to the release of water stored in a dam or reservoir through a turbine to activate a generator to produce electricity. It does not include small, low head, or other new hydropower technologies. See KELSIE BRACMORT, CHALES V. STERN, AND ADAM VANN, HYDROPOWER: FEDERAL AND NONFEDERAL INVESTMENT, CONGRESSIONAL RESEARCH SERVICE REPORT FOR CONGRESS, 1 (2013), *available at* www.fas.org/sgp/crs/misc/R42579.pdf.
- ²⁴⁹ U.S. ENERGY INFORMATION ADMINISTRATION, ELECTRIC POWER MONTHLY WITH DATA FOR SEPTEMBER 2013, Table 1.1 (2013), *available at* <http://www.eia.gov/electricity/monthly/> (indicating that total electricity generation in the U.S. in 2012 was 4,054,485 GWh, total renewable generation was 495,322 GWh, and total hydropower generation was 276, 535 GWh).

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- ²⁵⁰ U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, BUDGET JUSTIFICATIONS AND PERFORMANCE INFORMATION: FISCAL YEAR 2014, General Statement-2 (2013), *available at* <http://www.usbr.gov/budget/>.
- ²⁵¹ U.S. Department of the Interior Bureau of Reclamation, About Us: Roles and Responsibilities (last updated Jan. 31, 2014), <http://www.usbr.gov/power/who/who.html>.
- ²⁵² U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, *supra* note 250, at General Statement-2 (2013).
- ²⁵³ *Id.*
- ²⁵⁴ U.S. Environmental Protection Agency, Clean Energy: Hydroelectricity (last updated Sep. 25, 2013), <http://www.epa.gov/cleanenergy/energy-and-you/affect/hydro.html> (indicating that “[h]ydropower’s air emissions are negligible because no fuels are burned”).
- ²⁵⁵ *Id.*
- ²⁵⁶ U.S. Department of the Interior Bureau of Reclamation, The Hydropower Industry (last updated Apr. 6, 2006), <http://www.usbr.gov/power/who/hydropwr.html>.
- ²⁵⁷ NATIONAL ACADEMY OF SCIENCES, NATIONAL ACADEMY OF ENGINEERS, AND NATIONAL RESEARCH COUNCIL, ELECTRICITY FROM RENEWABLE RESOURCES: STATUS, PROSPECTS, AND IMPEDIMENTS, 205 - 206 (2010), *available at* http://www.nap.edu/openbook.php?record_id=12619.
- ²⁵⁸ AMERICAN SOCIETY OF CIVIL ENGINEERS, 2013 REPORT CARD FOR AMERICA’S INFRASTRUCTURE (2013), *available at* <http://www.infrastructurereportcard.org/a/#p/home>.
- ²⁵⁹ U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, HYDROPOWER RESOURCE ASSESSMENT AT EXISTING RECLAMATION FACILITIES (2011), *available at* <http://www.usbr.gov/power/AssessmentReport/index.html>.
- ²⁶⁰ U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, SITE INVENTORY AND HYDROPOWER ENERGY ASSESSMENT OF RECLAMATION OWNED CONDUITS: SUPPLEMENT TO THE HYDROPOWER RESOURCE ASSESSMENT AT EXISTING RECLAMATION FACILITIES REPORT (2012), *available at* <http://www.usbr.gov/power/CanalReport/>.
- ²⁶¹ Press Release, U.S. Department of the Interior, Additional 1.5 Million Megawatt-hours of Renewable Energy Could be Generated Through Hydropower at Existing Reclamation Sites (2012), *available at* <http://www.doi.gov/news/pressreleases/Additional-1-pt-5-Million-Megawatt-hours-of-Renewable-Energy-Could-Be-Generated-through-Hydropower-at-Existing-Reclamation-Sites.cfm>.
- ²⁶² U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, ASSESSMENT OF POTENTIAL CAPACITY INCREASES AT EXISTING HYDROPOWER PLANTS, 9-9 – 9-12 (2010), *available at* <http://www.usbr.gov/power/AssessmentReport/USBRHMICapacityAdditionFinalReportOctober2010.pdf>.
- ²⁶³ U.S. Energy Information Administration, How Much Electricity Does an American Home Use (last updated Mar. 19, 2013), <http://www.eia.gov/tools/faqs/faq.cfm?id=97&t=3> (estimating that, in 2011, the average annual electricity consumption for U.S. residential customers was 11,280 KWh).
- ²⁶⁴ *Hearing on Investment in Small Hydropower: Proposals for Expanding Low-Impact and Affordable Hydropower Generation in the West Before the Subcomm. on Water and Power of the H. Comm. on Natural*

Resources, 111th Cong. (2010) (statement of the Hon. Michael L. Connor, Commissioner, Bureau of Reclamation, U.S Department of the Interior).

- ²⁶⁵ Reclamation operates dams and other water works in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, South Dakota, Oklahoma, Oregon, Texas, Utah, Washington, and Wyoming.
- ²⁶⁶ BRACMORT ET AL., *supra* note 248, at 7.
- ²⁶⁷ *Id.*
- ²⁶⁸ U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, *supra* note 259, at ES-4 (identifying 191 dams and other facilities operated by Reclamation that have undeveloped hydroelectric potential of approximately 1.2 million MWh annually); U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, *supra* note 260, at 6 (concluding that an additional 373 sites on Reclamation canals have undeveloped hydroelectric potential of over 365,000 MWh annually).
- ²⁶⁹ Assuming that fossil-fuel power plants produce, on average, 0.8 tons of carbon dioxide per MWh of electricity generated. See U.S. Environmental Protection Agency, Clean Energy: Coal (last updated Sep. 25, 2013), <http://www.epa.gov/cleanenergy/energy-and-you/affect/coal.html> (estimating average carbon dioxide emissions from coal-fired generation at 2,249 pounds per MWh); U.S. Environmental Protection Agency, Clean Energy: Oil (last updated Sep. 25, 2013), <http://www.epa.gov/cleanenergy/energy-and-you/affect/oil.html> (estimating average carbon dioxide emissions from oil-fired generation at 1,672 pounds per MWh); U.S. Environmental Protection Agency, Clean Energy: Natural Gas (last updated Sep. 25, 2013), <http://www.epa.gov/cleanenergy/energy-and-you/affect/natural-gas.html> (estimating average carbon dioxide emissions from natural gas-fired generation at 1,135 pounds per MWh).
- ²⁷⁰ BRACMORT ET AL., *supra* note 248, at 1.
- ²⁷¹ U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, *supra* note 259, at ES-4.
- ²⁷² *Id.* at ES-4.
- ²⁷³ *Id.* at ES-3.
- ²⁷⁴ *Id.*
- ²⁷⁵ *Id.* at ES-4.
- ²⁷⁶ *Hearing on Investment in Small Hydropower: Proposals for Expanding Low-Impact and Affordable Hydropower Generation in the West Before the Subcomm. on Water and Power of the H. Comm. on Natural Resources*, 111th Cong. 1 (2010) (statement of the Hon. Michael L. Connor, Commissioner, Bureau of Reclamation, U.S Department of the Interior).
- ²⁷⁷ As discussed above, FERC may issue licenses authorizing the construction and operation of hydropower facilities at sites not authorized for development by Reclamation. See *supra* section 5.1.
- ²⁷⁸ See *supra* section 5.1.
- ²⁷⁹ U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, LEASE OF POWER PRIVILEGE DEVELOPMENT (2013) available at <http://www.usbr.gov/power/LOPP/CurrentLOPDevelopment9-10-2013>. An additional six projects are currently under development on Reclamation sites.

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- ²⁸⁰ U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, RECLAMATION MANUAL: LEASE OF POWER PRIVILEGE (LOPP) PROCESSES, RESPONSIBILITIES, TIMELINES, AND CHARGES, 6 (2012), available at www.usbr.gov/recman/fac/fac04-08.pdf.
- ²⁸¹ *Id.* at 9 (requiring developers to begin constructing hydropower facilities on dams within two years of the date of execution of the lease of power privilege and begin constructing hydropower facilities on conduits within one year and nine months of the date of execution of the lease of power privilege).
- ²⁸² BRACMORT ET AL., *supra* note 248, at 5.
- ²⁸³ *Id.* at 7.
- ²⁸⁴ U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, *supra* note 262.
- ²⁸⁵ *Id.* at 9-8.
- ²⁸⁶ *Id.*
- ²⁸⁷ *Id.* at 9-8 – 9-12.
- ²⁸⁸ *Id.* at 9-13.
- ²⁸⁹ Assuming that fossil-fuel power plants produce, on average, 0.8 tons of carbon dioxide per MWh of electricity generated. See U.S. Environmental Protection Agency, Clean Energy: Coal (last updated Sep. 25, 2013), <http://www.epa.gov/cleanenergy/energy-and-you/affect/coal.html> (estimating average carbon dioxide emissions from coal-fired generation at 2,249 pounds per MWh); U.S. Environmental Protection Agency, Clean Energy: Oil (last updated Sep. 25, 2013), <http://www.epa.gov/cleanenergy/energy-and-you/affect/oil.html> (estimating average carbon dioxide emissions from oil-fired generation at 1,672 pounds per MWh); U.S. Environmental Protection Agency, Clean Energy: Natural Gas (last updated Sep. 25, 2013), <http://www.epa.gov/cleanenergy/energy-and-you/affect/natural-gas.html> (estimating average carbon dioxide emissions from natural gas-fired generation at 1,135 pounds per MWh).
- ²⁹⁰ Memorandum of Understanding between the Department of Energy, the Department of the Interior, and the Department of the Army on Hydropower (executed March 24, 2010), available at www.usbr.gov/power/SignedHydropowerMOU.pdf.
- ²⁹¹ Press Release, U.S. Department of the Interior Bureau of Reclamation, Hydropower Generating Opportunities Increasing at Bureau of Reclamation Facilities (Sep. 13, 2013), available at <http://www.usbr.gov/newsroom/newsrelease/detail.cfm?RecordID=44591>.
- ²⁹² *Id.*
- ²⁹³ U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, *supra* note 262, at 9-8 – 9-12.
- ²⁹⁴ *Hearing on Investment in Small Hydropower: Proposals for Expanding Low-Impact and Affordable Hydropower Generation in the West Before the Subcomm. on Water and Power of the H. Comm. on Natural Resources*, 111th Cong. (2010) (statement of the Hon. Michael L. Connor, Commissioner, Bureau of Reclamation, U.S Department of the Interior).
- ²⁹⁵ U.S. Department of the Interior Bureau of Reclamation, About Us (last updated Jan. 16, 2013), <http://www.usbr.gov/main/about/>.
- ²⁹⁶ U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, THE BUREAU OF RECLAMATION'S SUSTAINABLE ENERGY STRATEGY: FISCAL YEAR 2013-2017, C-2 (2013), available at <http://www.usbr.gov/power/Reclamation%20Sustainable%20Energy%20Strategy%20.pdf>.

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- 297 *Id.* at 2.
- 298 Navajo Generating Station, NGS Facts (last visited Apr. 2, 2014), <http://www.ngspower.com/facts.aspx>.
- 299 Central Arizona Project, CAP Background (last visited Apr. 2, 2014), <http://www.cap-az.com/index.php/cap-background>.
- 300 Memorandum on Federal Leadership on Energy Management, 78 Fed. Reg. 75,209 (Dec. 5, 2013) (directing executive agencies to obtain twenty percent of their energy requirements from renewable sources by 2020).
- 301 DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, *supra* note 296, at C-2.
- 302 *Id.* at C-2.
- 303 U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE, CLIMATE CHANGE RESPONSE STRATEGY, 5 (2010), available at http://www.nps.gov/orgs/ccrp/upload/NPS_CCRS.pdf.
- 304 *Id.*
- 305 *Id.*
- 306 U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE, CLIMATE CHANGE ACTION PLAN 2012-2014, 11 (2012), available at http://www.nps.gov/orgs/ccrp/upload/NPS_CCActionPlan.pdf.
- 307 *Id.*
- 308 *Id.*
- 309 *Id.*
- 310 *Id.*
- 311 *Id.*
- 312 U.S. National Park Service, Frequently Asked Questions (last updated Mar. 31, 2014), <http://www.nps.gov/faqs.htm>.
- 313 U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE, NATIONAL PARK SYSTEM (2013), available at <http://www.nps.gov/news/upload/CLASSLST-401-updated-06-14-13.pdf>.
- 314 U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE, *supra* note 303, at 12.
- 315 U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE, *supra* note 306, at 15.
- 316 *Id.*
- 317 U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE, *supra* note 303, at 21.
- 318 U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE, *supra* note 306, at 14.
- 319 *Id.* at 26.
- 320 First Solar, Desert Sunlight Solar Farm Project Overview (last visited Apr. 1, 2014), <http://www.firstsolar.com/en/about-us/projects/desert-sunlight-solar-farm>.
- 321 *Id.* at 10 (indicating that, in addressing climate change, NPS can act “as a role model and leader, setting examples that others can follow”).

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- 322 U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE, *supra* note 303, at 19.
- 323 U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE, GREEN PARKS PLAN: ADVANCING OUR MISSION THROUGH SUSTAINABLE OPERATIONS 7 (2012), *available at* http://www.nps.gov/greenparksplan/downloads/NPS_2012_Green_Parks_Plan.pdf.
- 324 *Id.*
- 325 U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE, GREEN PARKS PLAN: ONE-YEAR REVIEW, 3 (2013), *available at* <http://www.nps.gov/greenparksplan/downloads/Green%20Parks%20Plan%20One-Year%20Review.pdf>.
- 326 *Id.* at 2.
- 327 In its 2012 Green Parks Plan, NPS set a goal of reducing its fossil fuel consumption by twenty percent by 2015 from the 2005 baseline. See U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE, *supra* note 323, at 10.
- 328 U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE, *supra* note 325, at 3.
- 329 *Id.* at 2.
- 330 The National Parks Omnibus Management Act (16 U.S.C. § 5901 et seq.) does not define what constitutes “field and special purpose equipment.” Notably however, other statutory provisions include references to “vehicles and other equipment.” See, for example, 16 U.S.C. § 17g (2014) (authorizing the Secretary of the Interior to provide field employees with fuel for “vehicles and other equipment”). This strongly suggests that Congress intended the word “equipment” to include motor vehicles.
- 331 NPS manages over eighty four million acres of land across U.S. states, territories, and island possessions. See *supra* section 6.1.
- 332 U.S. Department of the Interior National Park Service, Zion National Park Utah, Shuttle System (last updated May 20, 2014), <http://www.nps.gov/zion/planyourvisit/shuttle-system.htm>.
- 333 *Id.*
- 334 HABIBA GITAY, AVELINA SUÁREZ, ROBERT WATSON, OLEG ANISIMOV, F.S. CHAPIN, REX VICTOR CRUZ, MAX FINLAYSON, WILLIAM HOHENSTEIN, GREGORY INSAROV, ZBIGNIEW KUNDZEWICZ, RIK LEEMANS, CHRIS MAGADZA, LEONARD NURSE, IAN NOBLE, JEFF PRICE, N.H. RAVINDRANATH, TERRY ROOT, BOB SCHOLLES, ALICIA VILLAMIZAR, AND XU RUMEI, CLIMATE CHANGE AND BIODIVERSITY: IPCC TECHNICAL PAPER V, 1 (2002), *available at* <http://www.ipcc.ch/pdf/technical-papers/climate-changes-biodiversity-en.pdf> (finding that “[t]he general effect of projected human-induced climate change is that the habitats of many species will move poleward or upward from their current locations”). See also J.B. Ruhl, *Climate Change and the Endangered Species Act: Building Bridges to the No-Analog Future* 88 B. L. U. REV. 1, 23 (2008) (noting that climate change may lead to stranding as “[s]ome species will not be able to withstand the degradation or complete loss of essential habitat conditions beyond tolerable thresholds”).
- 335 GITAY ET AL., *supra* note 334, at 1 (concluding that climatic changes “have affected the timing of reproduction in animals and plants and/or migration of animals”). See also Ruhl, *supra* note 334, at 24 (indicating that “[s]ome species will find ecological conditions for essential life-stage junctures, such as migratory pathways or refuge habitat during juvenile stages, disrupted beyond tolerable thresholds”).

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- ³³⁶ GITAY ET AL., *supra* note 334, at 13 (finding that “[c]hanges in climatic variables have led to increased...outbreaks of pests and diseases”).
- ³³⁷ Lenny Bernstein, Peter Bosch, Osvaldo Canziani, Zhenlin Chen, Renate Christ, Ogunlade Davidson, William Hare, Saleemul Huq, David Karoly, Vladimir Kattsov, Zbigniew Kundewicz, Jian Liu, Ulrike Lohmann, Martin Manning, Taroh Matsuno, Bettina Menne, Bert Metz, Monirul Mirza, Neville Nicholls, Leonard Nurse, Rajendra Pachauri, Jean Palutikof, Martin Parry, Dahe Qin, Nijavalli Ravindranath, Any Reisinger, Jiawen Ren, Keywan Riahi, Cynthia Rosenzweig, Matilde Rusticucci, Stephen Schneider, Youba Sokona, Susan Solomon, Peter Stott, Ronald Stouffer, Taishi Sugiyama, Rob Swart, Dennis Tirpak, Coleen Vogel, and Gary Yohe, *Summary for Policymakers*, in CLIMATE CHANGE 2007 SYNTHESIS REPORT 1, 19 (2007), available at http://www.ipcc.ch/publications_and_data/ar4/syr/en/spm.html.
- ³³⁸ *Id.*
- ³³⁹ The National Marine Fisheries Service (“**NMFS**”), within the National Oceanic and Atmospheric Administration, administers the ESA (16 U.S.C. § 1531 et seq.) for most marine and anadromous fish. The functions and powers of the NMFS are not considered in this report.
- ³⁴⁰ Endangered Species Act § 3(6); 16 U.S.C. § 1532(6) (2014).
- ³⁴¹ Endangered Species Act § 3(20); 16 U.S.C. § 1532(20) (2014).
- ³⁴² Endangered Species Act § 2(b); 16 U.S.C. § 1531(b) (2014).
- ³⁴³ Philip E. Hulme, *Adapting to Climate Change: Is There Scope for Ecological Management in the Face of a Global Threat?* 42 J. APPLIED ECOLOGY 784, 784 (2005).
- ³⁴⁴ In announcing that the polar bear (*ursus maritimus*) would be listed as a threatened species due to climate change, then Secretary of the Interior, Dirk Kempthorne, indicated that the ESA (16 U.S.C. § 1531 et seq.) should not be used “to regulate greenhouse gas emissions from automobiles, power plants, and other sources.” See Press Release, U.S. Department of the Interior, Sec’y Kempthorne Announces Decision to Protect Polar Bears Under Endangered Species Act (May 14, 2008), available at http://www.fws.gov/home/feature/2008/polarbear012308/pdf/DOI_polar_bear_news_release.pdf.
- ³⁴⁵ See *infra* section 7.2.2.
- ³⁴⁶ GITAY ET AL., *supra* note 334, at 1 (concluding that climate change will cause “the habitats of many species...[to] move poleward and upward from their current locations”).
- ³⁴⁷ *Id.* at 13 (finding that climate change will lead to an increase in pest and disease outbreaks). See also U.S. Fish and Wildlife Service, *Conservation in a Changing Climate: Consequences for Wildlife* (last updated Nov. 13, 2012), <http://www.fws.gov/home/climatechange/impacts.html> (indicating that “climate change has very likely increased the size and number of...pathogens, [and] disease outbreaks”).
- ³⁴⁸ Ruhl, *supra* note 334, at 32 (arguing that “[g]reenhouse gas emissions are unquestionably a ‘manmade factor,’ and if as abundant evidence suggests they are contributing to climate change, they are potentially ‘affecting...[the] continued existence’ of climate-threatened species”).
- ³⁴⁹ U.S. Fish and Wildlife Service, Polar Bear Listing Determination 73 Fed. Reg. 28,212, 28,241 (May 15, 2008) (indicating that, while “there are some existing regulatory mechanisms to address anthropogenic causes of climate change...these mechanisms are not expected to be effective in counteracting the worldwide growth of GHG [greenhouse gas] emissions in the foreseeable future”).
- ³⁵⁰ *Id.*

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- 351 *Id.* at 28,275 - 28,277.
- 352 *Id.* at 28,280 - 28,281.
- 353 *Id.* at 28,281 - 28,288.
- 354 *Natural Res. Def. Council v. Kempthorn*, 506 F. Supp. 2d 322 (E.D. Cal. 2007) (holding that FWS should have considered the impact of climate change on a threatened species of fish – the Delta smelt – when assessing a federally managed project affecting that species).
- 355 *Appropriators Urge Interior to Deepen Review of How Global Warming is Affecting Species* 38 ENV'T REP. (BNA) 1015, 1015 (2007).
- 356 *Tenn. Valley Auth. v. Hill*, 437 U.S. 153 (1978).
- 357 For the reasons discussed below, we believe that there is a good argument that the ESA (16 U.S.C. § 1531 et seq.) can be used to control greenhouse gas emissions and other climate-damaging activities. However, we note that such action may be politically difficult. For a discussion of this issue see Ruhl, *supra* note 334.
- 358 Alison Winter, *Interior will keep Bush's Polar Bear Rule*, N.Y. TIMES, May 8, 2009, available at <http://www.nytimes.com/gwire/2009/05/08/08greenwire-interior-will-keep-bushs-polar-bear-rule-19116.html> (quoting former Secretary of the Interior Ken Salazar as stating that “[w]hen the ESA was passed, it was not contemplated it would be the tool to address the issue of climate change” and, as such, “[i]t seems to me that using the...Act as a way to get to that global warming framework is not the right way to go”).
- 359 50 C.F.R. § 402.02 (2014).
- 360 50 C.F.R. § 402.02 (2014).
- 361 50 C.F.R. § 402.02 (2014).
- 362 U.S. Department of the Interior Fish and Wildlife Service, Polar Bear Listing Determination 73 Fed. Reg. 28,212, 28,300 (May 15, 2008). See also Memorandum from the Director, U.S. Fish and Wildlife Service to Regional Directors, Regions 1-8 (May 14, 2008), available at <http://www.fws.gov/policy/m0331.pdf> (indicating that FWS “does not anticipate that the mere fact that a Federal agency authorizes a project that is likely to emit GHG [greenhouse gas] will require the initiation of section 7 consultation”).
- 363 U.S. Department of the Interior Fish and Wildlife Service, Polar Bear Listing Determination 73 Fed. Reg. 28,212, 28,300 (May 15, 2008).
- 364 Alexander et al., *supra* note 2, at SMP-12.
- 365 The IPCC uses the term “very likely” to indicate that there is a ninety to one hundred percent chance of a particular outcome or result. *Id.* at footnote 2.
- 366 *Id.* at 5-7.
- 367 Bernstein et al., *supra* note 337.
- 368 John Kostyack and Dan Rohlf, *Conserving Endangered Species in an Era of Global Warming*, 38 ELR 10203, 10211 (2008).

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- ³⁶⁹ Brendan R. Cummings and Kassie R. Siegel, *Ursus Maritimus: Polar Bears on Thin Ice*, 22 NAT. RESOURCES & ENV'T. 3, 7 (2007).
- ³⁷⁰ *Id.*
- ³⁷¹ Endangered Species Act § 7(b)(3)(A); 16 U.S.C. § 1536(b)(3)(A) (2014).
- ³⁷² 50 C.F.R. § 402.02 (2014).
- ³⁷³ Kostyack et al., *supra* note 368, at 10204.
- ³⁷⁴ *Id.*
- ³⁷⁵ 50 C.F.R. §§ 17.21, 17.31, and 17.40-17.48 (2014).
- ³⁷⁶ The take prohibition applies to all “persons.” “Person” is defined broadly to include any individual, corporation, and other private entity, and any officer, employee, agent, department, or instrumentality of the federal government, a State or a political subdivision thereof, or any foreign government subject to the jurisdiction of the U.S. See Endangered Species Act § 3(13), 16 U.S.C. § 1532(13) (2014).
- ³⁷⁷ S. Rep. No. 93-307, 7 (1973). See also H.R. Rep. No. 93-412, 154 (1973) (indicating that the take prohibition in section 9 “includes, in the broadest possible terms, restrictions on the taking of endangered species”).
- ³⁷⁸ The Congressional Record indicates that the definition was intended to cover “every conceivable way in which a person can ‘take’ any fish or wildlife.” Sen. Rpt. 93-307 (July 6, 1973) (reprinted in 1973 U.S.C.C.A.N. 2989, 2995).
- ³⁷⁹ 50 C.F.R. § 17.3 (2014).
- ³⁸⁰ *Babbitt v. Sweet Home Chapter of Cmty. for a Great Or.*, 515 U.S. 687, 704 (1995).
- ³⁸¹ *Winter*, *supra* note 358.
- ³⁸² “Incidental take” refers to the take of a listed species that is incidental to, but not the purpose of, an otherwise lawful activity. Endangered Species Act § 10(a)(1)(B); 16 U.S.C. § 1539(a)(1)(B) (2014).
- ³⁸³ Endangered and Threatened Wildlife and Plants: Special Rule for the Polar Bear, 73 Fed. Reg. 76,249 (Dec. 16, 2008), vacated and replaced by Special Rule for the Polar Bear Under Section 4(d) of the Endangered Species Act, 78 Fed. Reg. 11,766 (Feb. 20, 2013).
- ³⁸⁴ *In re Polar Bear Endangered Species Act Listing and § 4(d) rule litigation* 818 F. Supp. 2d 214 (D.D.C. 2011) (summarizing the position of FWS).
- ³⁸⁵ Alexander et al., *supra* note 2, at SMP-12.
- ³⁸⁶ GITAY ET AL., *supra* note 334, at 5-7.
- ³⁸⁷ U.S. Department of the Interior Fish and Wildlife Service, Polar Bear Listing Determination 73 Fed. Reg. 28,212, 28,292 (May 15, 2008).
- ³⁸⁸ *Id.*
- ³⁸⁹ *Id.* As discussed above, FWS has issued a special rule providing that the take prohibition does not apply to any incidental take of polar bears resulting from activities that occur outside of the bears’ range. See Endangered and Threatened Wildlife and Plants: Special Rule for the Polar Bear 73 Fed. Reg. 76,249 (Dec.

16, 2008), vacated and replaced by Special Rule for the Polar Bear Under Section 4(d) of the Endangered Species Act 78 Fed. Reg. 11,766 (Feb. 20, 2013).

³⁹⁰ Sarah Jane Morath, *The Endangered Species Act: A New Avenue for Climate Change Litigation?* 29 PUB. LAND & RESOURCES L. REV. 23 (2008).

³⁹¹ *Id.* at 25.

³⁹² Ari N. Sommer, *Taking the Pit Bull off the Leash: Siccing the Endangered Species Act on Climate Change*, 36 ENVTL. AFF. 273, 298 (2009).

³⁹³ Matthew Gerhart, *Climate Change and the Endangered Species Act: The Difficulty of Proving Causation*, 36 ECOLOGY L.Q. 167 (2009).

³⁹⁴ *Mass. v. Env'tl. Prot. Agency*, 549 U.S. 497, 523 - 524 (2007).

³⁹⁵ *Id.* at 524 - 525.

³⁹⁶ Gerhart, *supra* note 393, at 187.

³⁹⁷ See, for example, Jacqueline Peel, *Issues in Climate Change Litigation*, 1 CARBON & CLIMATE L. REV. 15 (2011); Hari M. Osofsky, *Is Climate Change 'International'? Litigation's Diagonal Regulatory Role*, 49:3 VA. J. INT'L L. 585 (2009).

³⁹⁸ Peel, *supra* note 397, at 16.

³⁹⁹ *Id.*

⁴⁰⁰ *Id.* at 17.

⁴⁰¹ Endangered Species Act § 11(g); 16 U.S.C. § 1540(g) (2014) (authorizing any person to commence a civil suit on his or her own behalf to enjoin any other person who is alleged to be violating any provision of the Act).

⁴⁰² Alexander et al., *supra* note 2, at SMP-12.

⁴⁰³ 2013 State of the Union Address, *supra* note 17.

⁴⁰⁴ *Id.* (indicating that, if Congress does not enact legislation addressing climate change, the President will take executive action to control pollution and encourage clean energy development). See also EXECUTIVE OFFICE OF THE PRESIDENT, *supra* note 19 (directing various executive agencies to take steps to reduce greenhouse gas emissions and support clean energy projects).

⁴⁰⁵ Executive Office of the President, *supra* note 19.

⁴⁰⁶ *Id.*

⁴⁰⁷ Black, *supra* note 28, at 1.

⁴⁰⁸ CLEMENT ET AL., *supra* note 233, at 1.

⁴⁰⁹ U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, *supra* note 250, at General Statement-2.

⁴¹⁰ U.S. Department of the Interior Fish and Wildlife Service, [Environmental Conservation Online System: Summary of Listed Species, Listed Populations, and Recovery Plans](http://ecos.fws.gov/tess_public/pub/boxScore.jsp) (last updated Apr. 7, 2014), http://ecos.fws.gov/tess_public/pub/boxScore.jsp (last visited Dec. 3, 2013).

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- ⁴¹¹ U.S. Department of the Interior National Park Service, Frequently Asked Questions (last updated Nov. 6, 2013), <http://www.nps.gov/faqs.htm> (last updated Nov. 6, 2013).
- ⁴¹² U.S. Department of the Interior Bureau of Land Management, New Energy for America (last updated Mar. 14, 2014), http://www.blm.gov/wo/st/en/prog/energy/renewable_energy.html. See *supra* section 4.
- ⁴¹³ Press Release, U.S. Department of the Interior Bureau of Reclamation, Hydropower Generating Opportunities Increasing at Bureau of Reclamation Facilities (Sep. 13, 2013), *available at* <http://www.usbr.gov/newsroom/newsrelease/detail.cfm?RecordID=44591>. See *supra* section 5.
- ⁴¹⁴ U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE, *supra* note 223, at 2. See *supra* section 4.2.2.