UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

IN THE MATTER OF	)	
	)	**FE DOCKET NO. 12-32-LNG**
Jordan Cove Energy Project, L.P.	)	
	)	

SIERRA CLUB'S MOTION TO INTERVENE, PROTEST, AND COMMENTS

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Table of Contents

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Jordan Cove Energy Project, L.P. ("Jordan Cove") requests authorization to export up to 0.8 billion cubic feet per day (bcf/d) of natural gas as liquefied natural gas ("LNG") from a proposed LNG export terminal in Coos Bay, Oregon. This proposal cannot move forward without extensive environmental and economic analyses that Jordan Cove has not provided to the Department of Energy Office of Fossil Energy ("DOE/FE"). In any event, the available evidence demonstrates that this proposal is inconsistent with the public interest.

Jordan Cove argues that exports from its proposed terminal would be in the public interest in significant part because they would support increased domestic production of natural gas. Perhaps so, but Jordan Cove offers no meaningful analysis of the significant environmental and economic dislocations associated with the shale gas boom that it claims its facility would enhance. DOE/FE cannot authorize exports without fairly weighing these impacts. *See, e.g., Udall v. Federal Power Comm'n*, 387 U.S. 428, 450 (1967). If it did so, it would have to conclude that the export project should not be authorized. In addition, construction and operation of the terminal and pipeline necessary to carry out Jordan Cove's export proposal will further harm the public interest by imposing additional significant adverse environmental impacts.

Because Sierra Club's many thousands of members have a direct interest in ensuring that domestic natural gas production is conducted safely, and that any exports do not adversely affect domestic consumers, Sierra Club therefore moves to intervene in this proceeding and protests Jordan Cove's application.

I. Sierra Club Should be Granted Intervention

Sierra Club members live and work throughout the area that will be affected by the Jordan Cove export plan, including in the regions adjacent to the proposed facility and in regions near the pipelines and gas fields necessary to supply the plant. Sierra Club members everywhere will also be affected by increased gas prices which would be caused by the plan. As of July 2012, Sierra Club had 15,525 members in Oregon and 601,141 members overall. Declaration of Yolanda Andersen at ¶ 7.[1] To protect its members' interests, Sierra Club therefore moves to intervene in this proceeding, pursuant to 10 C.F.R. § 590.303(b).

Consistent with that rule, Sierra Club states that its "asserted rights and interests," in this matter include, but are not limited to, its interests in the following:

- The environmental consequences of any gas exports from the Jordan Cove facility, including emissions and other pollution associated with the gasification and liquefaction processes, environmental damage associated with pipeline, facility construction and operation, environmental impacts caused by shipping traffic, and the emissions associated with all phases of the process from production to combustion.
- The environmental and economic consequences of any expansion or change in natural gas production, especially in shale gas plays, as a result of increased gas exports. Jordan predicts that much of the gas will be sourced from Rocky Mountain shale plays will and that the proposal would cause production to increase in these and other gas producing regions. Sierra Club members living in these regions will be affected by the damage to air, land, and water resources caused by the increasing development of these plays, and the public health risks caused by these harms.
- The economic impacts of any gas exports from the Jordan Cove facility, whether individually or in concert with exports from other such facilities, including the consequences of price changes upon its members' finances, consumer behavior generally, and industrial and electrical generating facilities whose fuel choices may be affected by price changes. Sierra Club, in particular, works to reduce U.S. and global dependence on fossil fuels, including coal, gas, and oil, and to promote clean energy and efficiency in order to protect public health and the environment. To the extent changes in gas prices increase the use and production of fossil fuels, Sierra Club's interests in this proceeding are directly implicated.
- The public disclosure, in National Environmental Protection Act and other documents, of all environmental, cultural, social, and economic consequences of Jordan Cove's proposal, and of all alternatives to that proposal.

[1] Attached as Exhibit 1.

In short, Sierra Club's members have vital economic, aesthetic, spiritual, personal, and professional interests in the project.

Sierra Club has demonstrated the vitality of these interests in many ways. Sierra Club runs national advocacy and organizing campaigns dedicated to reducing American dependence on fossil fuels, including natural gas, and to protecting public health. These campaigns, including its Beyond Coal campaign and its Beyond Natural Gas campaign, are dedicated towards promoting a swift transition away from fossil fuels and to reducing the impacts of any remaining natural gas extraction.

Thus, although 10 C.F.R. § 590.303 states no particular standard for intervention, Sierra Club's interests in this proceeding would be sufficient to support intervention on any standard. Its motion must be granted.[2]

II. Service

Pursuant to 10 C.F.R. § 590.303(d), Sierra Club identifies the following persons for service of correspondence and communications regarding this application:

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III. Sierra Club Protests this Application Because It Is Not In the Public Interest and Is Not Supported by Adequate Environmental and Economic Analysis

Section 3 of the Natural Gas Act provides that DOE/FE cannot authorize exports unless it finds the exports to be in the public interest. 15 U.C.C. § 717b. Environmental factors must weigh in to this public interest analysis. Accordingly, DOE/FE cannot proceed with Jordan Cove's application without fully evaluating the environmental impacts of Jordan Cove's proposal. The National Environmental Policy Act ("NEPA"), 42 U.S.C. § 4332 *et seq.*, provides the congressionally mandated procedure for assessment of these

[2] If any other party opposes this motion, Sierra Club respectfully requests leave to reply. *Cf.* 10 C.F.R. §§ 590.302, 590.310 (allowing for procedural motions and briefing in these cases).

impacts, and NEPA requires that these procedures be completed "at the earliest possible time," *i.e.*, "*before* decisions are made and *before* actions are taken." 40 C.F.R. §§ 1501.2, 1500.1(b) (emphases added). Accordingly, DOE/FE cannot proceed with Jordan Cove's request for conditional export authorization until the NEPA process is completed, including preparation of an Environmental Impact Statement.

Jordan Cove's application is silent as to the environmental impacts of its proposal. For this and other reasons, Jordan Cove utterly fails to demonstrate that its proposal is in the public interest. As we explain below, the proposal will cause significant environmental harm. The proposed exports will induce additional natural gas production, primarily involving hydraulic fracturing ("fracking") of unconventional gas sources; indeed, Jordan Cove's application is largely premised on such inducement. But Jordan Cove ignores the fact that this production would have significant adverse impacts on air and water quality, landscapes, and habitats. In addition, Jordan Cove's proposal would require construction of hundreds of miles of additional gas pipeline, an industrial facility to liquefy the pipeline gas for export, and a terminal to transfer the LNG to massive tankers. These facilities will cause further environmental harm. As with induced production, however, Jordan Cove asks DOE/FE to consider the purported economic benefits of these facilities but Jordan Cove is silent about these facilities' environmental effects.

Jordan Cove's economic arguments are themselves unpersuasive. Contrary to Jordan Cove's contentions, LNG export will significantly increase domestic gas prices, harming domestic consumers and visiting further harm on the environment by inducing increased coal-fired electricity generation. On the other hand, Jordan Cove's predictions of job creation and other economic benefit are overstated. These predictions are derived from flawed IMPLAN input-output models. This method of analysis fails to account for the boom-bust cycles inherent in resource production and is unable to identify which of the purportedly "supported" jobs and benefits would have existed anyway.

For these reason and the other reasons set forth below, Sierra Club files this protest, pursuant to 10 C.F.R. § 590.304.

A. Legal Standard

DOE/FE has significant substantive and procedural obligations to fulfill before it can authorize Jordan Cove's export proposal. We discuss some of those obligations created by the Natural Gas Act, the National Environmental Policy Act, the Endangered Species Act, and the National Historic Preservation Act, here, before explaining why these obligations require DOE to deny export authorization in this case.

1. **Natural Gas Act**

Pursuant to the Natural Gas Act and subsequent delegation orders, DOE/FE must determine whether Jordan Cove's proposal to export LNG to nations which have not signed a free trade agreement ("FTA") with the United States is in the public interest.[3] This public interest determination must include evaluation of environmental impacts.

Section 3 of the Act provides:

> [N]o person shall export any natural gas from the United States to a foreign country or import any natural gas from a foreign country without first having secured an order of [DOE/FE] authorizing it do so. [DOE/FE] shall issue such order upon application unless, after opportunity for hearing, it finds that the proposed exportation or importation will not be consistent with the public interest.

15 U.S.C. § 717b(a).[4]

Courts have interpreted this provision to include environmental effects. While the public interest inquiry is rooted in the Natural Gas Act's "fundamental purpose [of] assur[ing] the public a reliable supply of gas at reasonable prices," *United Gas Pipe Line Co v. McCombs*, 442 U.S. 529 (1979), the Natural Gas Act also grants DOE/FE "authority to consider conservation, environmental, and antitrust questions." *Nat'l Ass'n for the Advancement of Colored People v. Federal Power Commission*, 425 U.S. 662, 670 n.4 (citing 15 U.S.C. § 717b as an example of a public interest provision); n.6 (explaining that the public interest includes environmental considerations) (1976). In interpreting an analogous public interest provision applicable to hydroelectric power and dams, the Court has explained that the public interest determination "can be made only after an

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[3] The Natural Gas Act separately provides that DOE/FE must approve exports to nations that have signed a free trade agreement requiring national treatment for trade in natural gas "without modification or delay." 15 U.S.C. § 717b(c). DOE/FE has previously authorized Jordan Cove to export 1.2 bcf/d LNG to such nations. DOE/FE Order No. 3041 (Dec. 7, 2011).

[4] The statute vests authority in the "Federal Power Commission," which has been dissolved. DOE/FE has been delegated the former Federal Power Commission's authority to authorize natural gas exports. Department of Energy Redelegation Order No. 00-002.04E (Apr. 29, 2011). The Federal Energy Regulatory Commission has separately been delegated authority regarding the permitting, siting, construction and operation of export facilities. Department of Energy Delegation Order No. 00-004.00A. *See also* Executive Orders 12038 & 10485 (vesting any executive authority to allow construction of export facility in the Federal Power Commission and its successors).

exploration of all issues relevant to the 'public interest,' including future power demand and supply, alternate sources of power, the public interest in preserving reaches of wild rivers and wilderness areas, the preservation of anadromous fish for commercial and recreational purposes, and the protection of wildlife." *Udall v. Fed. Power Comm'n*, 387 U.S. 428, 450 (1967) (interpreting § 7(b) of the Federal Water Power Act of 1920, as amended by the Federal Power Act, 49 Stat. 842, 16 U.S.C. § 800(b)). Other courts have applied this *Udall* holding to the Natural Gas Act. *See, e.g., N. Natural Gas Co. v. Fed. Power Comm'n*, 399 F.2d 953, 973 (D.C. Cir. 1968) (interpreting section 7 of the Natural Gas Act). [5]

DOE has similarly acknowledged the breadth of the public interest inquiry, including environmental concerns. Deputy Assistant Secretary Smith recently testified that "[a] wide range of criteria are considered as part of DOE's public interest review process, including... U.S. energy security... [i]mpact on the U.S. economy... [e]nvironmental considerations... [and] [o]ther issues raised by commenters and/or interveners deemed relevant to the proceeding." Testimony of Christopher Smith, Deputy Assistant Secretary of Oil and Gas Before the Senate Committee on Energy and Natural Resources (Nov. 8, 2011).[6] DOE rules require export applicants to provide information documenting "[t]he potential environmental impact of the project." 10 C.F.R. § 590.202(b)(7). In a previous LNG export proceeding, DOE determined that the public interest inquiry looks to "domestic need" as well as "other considerations," including the environment. *Phillips Alaska Natural Gas Corporation and Marathon Oil Company*, 2 FE ¶ 70,317, DOE FE Order No. 1473, *22 (April 2, 1999); *accord* Opinion and Order Conditionally Granting Long-Term Authorization to Export [LNG] from Sabine Pass LNG Terminal to Non-Free Trade Agreement Nations ("Sabine Pass"), DOE/FE Order 2961 at 29 (May 20, 2011) (acknowledging that the public interest inquiry extends beyond effects on domestic natural gas supplies). Finally, DOE has applied its "policy guidelines" regarding the public interest to focus review "on the domestic need for the natural gas proposed to be exports; whether the proposed exports pose a threat to the security of natural gas supplies, *and any other issue determined to be appropriate*." Sabine Pass at 29 (citing 49 Fed. Reg. 6,684 (Feb. 22, 1984)) (emphasis added).[7]

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[5] Further support for the inclusion of environmental factors in the public interest analysis is provided by NEPA, which declares that all federal agencies must seek to protect the environment and avoid "undesirable and unintended consequences." 42 U.S.C. 4331(b)(3).

[6] Attached as Exhibit 2.

[7] Although germane here, these Policy Guidelines are merely guidelines: they "cannot create a norm binding the promulgating agency." *Panhandle Producers and Royalty Owners Ass'n v. Economic Regulatory Administration*, 822 F.2d 1105, 1110-1111 (D.C. Cir. 1987).

Although DOE/FE has adopted a presumption that LNG export applications are consistent with the public interest, this presumption is rebuttable and not determinative. The DC Circuit Court has explained to DOE/FE this presumption is "highly flexible, creating *only* rebuttable presumptions and leaving parties free to assert other factors." *Panhandle Producers and Royalty Owners Ass'n v. Economic Regulatory Administration*, 822 F.2d 1105, 1110-1111, 1113 (D.C. Cir. 1987) (emphasis added, internal quotation marks omitted). Put differently, although DOE/FE may "presume" that an application should be granted, this presumption is not determinative, and DOE/FE retains an independent duty to determine whether an application is, in fact, in the public interest. *See* 10 C.F.R. § 590.404.

2. National Environmental Policy Act

NEPA requires federal agencies to consider and disclose the "environmental impacts" of proposed agency actions. 42 U.S.C. § 4332(C)(i). This requirement is implemented via a set of procedures that "insure [sic] that environmental information is available to public officials and citizens *before* decisions are made and *before* actions are taken." 40 C.F.R. § 1500.1(b) (emphases added). Agencies must "carefully consider [ ] detailed information concerning significant environmental impacts" and NEPA "guarantees that the relevant information will be made available" to the public. *Dep't of Transp. v. Public Citizen*, 541 U.S. 752, 768 (2004) (quoting *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989)). The Council on Environmental Quality ("CEQ") directs agencies to "integrate the NEPA process with other planning at the earliest possible time to insure that planning and decisions reflect environmental values." 40 C.F.R. § 1501.2. "It is DOE's policy to follow the letter and spirit of NEPA; comply fully with the [CEQ] Regulations and apply the NEPA review process early in the planning stages for DOE proposals." 10 C.F.R. § 1021.100. DOE has adopted CEQ's NEPA regulations in full. *Id.* § 1021.103. The NEPA rules apply to "any DOE action affecting the quality of the environment of the United States, its territories or possessions." *Id.* § 1021.102.

The NEPA procedures require the agency to prepare an Environmental Impact Statement ("EIS") where a proposed major federal action would "significantly affect[] the quality of the human environment." 42 U.S.C. § 4332(C). The "significance" of effects is determined by both the context and intensity of the proposed action. 40 C.F.R. § 1508.27. If there is a "substantial question" as to the severity of impacts, an EIS must be prepared. *See Klamath Siskiyou Wildlands Center v. Boody*, 468 F.3d 549, 561-62 (9th Cir. 2006) (holding that the "substantial question" test sets a "low standard" for plaintiffs to meet). DOE has determined that "[a]pprovals or disapprovals of authorizations to import or export natural gas... involving major operational changes (such as a major increase in the quantity of liquefied natural gas imported or exported" will "normally require [an] EIS." 10 C.F.R. Part 1021, Appendix D, D9; *see also* 40 C.F.R. § 1501.4 (discussing considerations relevant to whether to prepare an EIS). If it not clear that a proposal will "significantly" affect the environment, the agency may prepare an

"environmental assessment" ("EA") to determine whether an EIS is necessary. 40 C.F.R. § 1508.9.

An EIS must describe:

> i. the environmental impact of the proposed action,
>
> ii. any adverse environmental effects which cannot be avoided should the proposal be implemented,
>
> iii. alternatives to the proposed action,
>
> iv. the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
>
> v. any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

42 U.S.C. § 4332(C). The alternatives analysis "is the heart of the environmental impact statement." 40 C.F.R. § 1502.14. Here, the proposed action is to export LNG from the proposed facility; DOE/FE must consider alternatives to this action. DOE/FE must take care not to define the project purpose so narrowly as to prevent the consideration of a reasonable range of alternatives. *See, e.g., Simmons v. U.S. Army Corps of Engineers*, 120 F.3d 664, 666 (7th Cir. 1997). If it did otherwise, it would lack "a clear basis for choice among options by the decisionmaker and the public." *See* 40 C.F.R. § 1502.14.

An EIS must also describe the direct and indirect effects, and cumulative impacts of, a proposed action. 40 C.F.R §§ 1502.16, 1508.7, 1508.8; *Northern Plains Resource Council v. Surface Transportation Board*, - F.3d -, 2011 WL 6826409 at * 5 (9th Cir. 2011). These terms are distinct from one another: Direct effects are "caused by the action and occur at the same time and place." 40 C.F.R. § 1508.8(a). Indirect effects are also "caused by the action" but:

> are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effect on air and water and other natural systems, including ecosystems.

40 C.F.R. § 1508.8(b). Cumulative impacts, finally, are not causally related to the action. Instead, they are:

> the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

40 C.F.R. § 1508.7. The EIS must give each of these categories of effect fair emphasis.

Agencies may also prepare "programmatic" EISs, which address "a group of concerted actions to implement a specific policy or plan; [or] systematic and connected agency decisions allocating agency resources to implement a specific statutory program or executive directive." 40 C.F.R. § 1508.17(b)(3); *see also* 10 C.F.R. § 1021.330 (DOE regulations discussing this possibility). As we later discuss, such an EIS is appropriate here.

Finally, and critically, while an EIS is being prepared "DOE shall take no action concerning the proposal that is the subject of the EIS" until the EIS is complete and a formal Record of Decision has been issued. 10 C.F.R. § 1021.211. During this time, DOE may take no action which would tend to "limit the choice of reasonable alternatives," or "tend[] to determine subsequent development ." 40 C.F.R. § 1506.1.

The Natural Gas Act designated the old Federal Power Commission as the "lead agency" for NEPA purposes. 15 U.S.C. § 717n. FERC has since generally filled that role, preparing the NEPA documents for LNG export and import decisions, as it did in *Sabine Pass*. *See* 10 C.F.R. § 1021.342 (providing for interagency cooperation). Whether or not FERC takes a lead role, however, DOE's ultimate NEPA obligations are the same: It may not move forward until the full scope of the action *it* is considering – here the approval of LNG export – has been properly considered in a valid EIS. Thus, if FERC prepares an EIS or other NEPA document that only considers only the impacts of facility siting, etc., within FERC's separate jurisdiction, this EIS will not meet DOE/FE's NEPA obligations, and DOE/FE will be unable to rely thereon.

3. **Endangered Species Act**

Pursuant to the Endangered Species Act's (ESA) directive that all agencies "shall seek to conserve endangered species," 16 U.S.C. § 1531(c)(1), DOE/FE must ensure that its approval of the Jordan Cove project "is not likely to jeopardize the continued existence of any endangered species . . . or result in the destruction or adverse modification of [critical] habitat of such species." 16 U.S.C. § 1536(a)(2). "Each Federal agency shall review its actions at the earliest possible time to determine whether any action may affect listed species or critical habitat." 50 C.F.R. § 402.14(a); *see also* 16 U.S.C. § 1536(a)(2).

This determination must be wide-ranging, because Jordan Cove's export proposal will increase gas production activities nationwide. Thus, DOE/FE must consider not just the effects of the project at the proposed site (although it must at least do that)[8], but the effects of increased gas production across the full region the plant affects.

To make this determination, DOE/FE should, first, conduct a biological assessment, including the "results of an on-site inspection of the area affected," "[t]he views of recognized experts on the species at issue," a review of relevant literature, "[a]n analysis of the effects of the action on the species and habitat, including consideration of cumulative effects, and the results of any related studies," and "[a]n analysis of alternate actions considered by the Federal agency for the proposed action." *See* 50 C.F.R. § 402.12(f). If that assessment determines that impacts are possible, DOE/FE must enter into formal consultation with the Fish and Wildlife Service and the National Marine and Fisheries Service, as appropriate, to avoid jeopardizing any endangered species or adversely modifying its habitat as a consequences of its approval of Jordan Cove's proposal. 16 U.S.C. § 1536(a), (b).

4. **National Historic Preservation Act**

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[8] According to FERC's May 2009 Biological Assessment for Jordan Cove's prior LNG import proposal and associated pipeline, "[t]wenty-nine federally endangered or threatened species potentially occur in the" the areas directly affected by the proposed terminal and pipeline. FERC, *Biological Assessment and Essential Fish Habitat Assessment for the Jordan Cove Energy and Pacific Connector Gas Pipeline Project*, Table 2.1-1 (May 2009). Chapter 2 of this assessment is attached as Exhibit 3. These include the Steller Sea lion, blue whale, killer whale, fin whale, killer whale (Eastern Northern Pacific Southern Resident stock), humpback whale, sei whale, sperm whale, short-tailed albatross, brown pelican, Northern spotted owl, marbled murrelet, Western snowy plover, Lost River and shortnose suckers, green turtle, leatherback turtle, olive ridley turtle, loggerhead turtle, green sturgeon (southern distinct population segment), coho salmon (southern Oregon/northern California coast evolutionarily significant unit), coho salmon (Oregon coat evolutionarily significant unity), vernal pool fairy shrimp, large-flowered meadowfoam, Cook's lomatium, Applegate's milk-vetch, Gentner's fritillary, Western lily, Kincaid's lupine, rough popcorn flower. *Id.* In addition, the southern distinct population segment of the Pacific Eulachon, or Columbia River smelt, was listed as endangered effective May 17, 2010. *See* 75 Fed. Reg. 13,012 (March 18, 2010). NMFS has stated that this species would be affected by the proposed terminal and pipeline. National Marine Fisheries Service, *Comment on Final Environmental Impact Statement (FEIS) for the Jordan Cove Energy Liquefied Natural Gas (LNG) Terminal and Pacific Connector Gas Pipeline Project* (June 5, 2009) (hereinafter "NMFS Comment on CP07-441), attached as Exhibit 4.

DOE/FE must also fulfill its obligations under the National Historic Preservation Act (NHPA) to "take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register." 16 U.S.C. § 470f; *see also Pit River Tribe v. U.S. Forest Serv.*, 469 F.3d 768, 787 (9th Cir. 2006) (discussing the requirements of the NHPA). Because "the preservation of this irreplaceable heritage is in the public interest," 16 U.S.C. § 470(b)(4), it behooves DOE/FE to proceed with caution.

DOE/FE must, therefore, initiate the NHPA section 106 consultation and analysis process in order to "identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties." 36 C.F.R. § 800.1(a). NHPA regulations make clear that the scope of a proper analysis is defined by the project's area of potential effects, *see* 36 C.F.R. § 800.4, which in turn is defined as "the geographic area . . . within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties," 36 C.F.R. § 800.16(d). This area is "influenced by the scale and nature of an undertaking," *Id.* The area of potential effects should sweep quite broadly here because, as in the ESA and NEPA contexts, the reach of Jordan Cove's proposal extends to the entire area in which it will increase gas production. Thus, to approve Jordan Cove's proposal, DOE/FE must first understand and mitigate its impacts on any historic properties which it may affect. *See also* DOE Policy P.141.1 (May 2001) (providing that DOE will fully comply with the NHPA and many other cultural resources preservation statutes).

The regulations governing this process provide that "[c]ertain individuals and organizations with a demonstrated interest in the undertaking may participate as consulting parties" either "due to the nature of their legal or economic relation to the undertaking or affected properties, or their concern with the undertaking's effects on historic properties." 36 C.F.R. § 800.2(c)(5). Sierra Club meets that test, because the Club and its members are interested in preserving intact historic landscapes, for their ecological and social value, and reside through the regions affected by the Jordan Cove proposal. Its members have worked for years to protect and preserve the rich human and natural fabric of these regions, and would be harmed by any damage to those resources. Sierra Club must therefore be given consulting party status under the NHPA for this application.

B. DOE/FE Must Not Approve Jordan Cove's Export Plan Without a Proper NEPA Analysis

As explained above, DOE/FE's decision must include full consideration of the environmental impacts of Jordan Cove's proposal. NEPA process must be "coordinate[d] with its decisionmaking," 10 C.F.R. § 1021.210, and can usefully inform it. Indeed, because approval of a gas export application is a major federal action which may

significantly affect the environment, DOE/FE is barred from moving forward without a full EIS. Sierra Club therefore protests Jordan Cove's request for conditional exportation authorization prior to completion of the NEPA process.[9]

Here, NEPA requires an EIS that considers a full range of alternatives, including alternatives that would not export LNG from Coos Bay and, most importantly, the alternative of not exporting LNG to any non-free trade agreement countries. The EIS must further consider the environmental impacts of the induced production, pipeline development, and terminal construction and operation that Jordan Cove agrees are the consequences of its proposal.

1. **DOE/FE May Not Conditionally Approve Jordan Cove's Proposal Prior to NEPA Review**

Although as a general matter DOE/FE may issue "conditional" orders, *see* 10 C.F.R. § 590.402, this general authority cannot trump DOE's specific rules barring the agency from taking any "action concerning [a] proposal" that is the subject of an EIS, 10 C.F.R. § 1021.211, if that action tends to "limit the choice of reasonable alternatives," or "tend[] to determine subsequent development." 40 C.F.R. § 1506.1. As we explain below, Jordan Cove's proposal will have "significant" impacts, so a full EIS is required here. Additionally, the logically necessary implication of this regulation is that DOE/FE cannot take action that would limit alternatives when it remains to be determined whether an EIS is required.

A conditional approval limits alternatives, and determines subsequent choices, in precisely this forbidden way. The Sabine Pass EA and DOE/FE conditional approval in that case provide a good example of this problem. In *Sabine Pass*, DOE/FE expressed its "conditional" view that the project was in the public interest, conditioned on "the satisfactory completion of the environmental review process [by FERC] and on issuance by DOE/FE of a finding of no significant impact or a record of decision pursuant to NEPA." *Sabine Pass* at 41.

This decision was, first, irrational: As we have discussed at length above, DOE/FE cannot complete a public interest determination without weighing environmental factors. Because these factors are integral to DOE/FE's decision, and NEPA is purely procedural statute, DOE/FE must weigh environmental interests at the same time that weighs all other interests. It may not parcel them into a separate process without irrationally ignoring required statutory factors and important aspects of the problem before it on the record.

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[9] Similarly, Sierra Club protests any request for final, rather than conditional, authorization prior to completion of NEPA review.

Second, DOE/FE's approval, even if nominally "conditional," plainly influenced the NEPA process. In the Sabine Pass EA, although FERC acknowledged that DOE/FE was making a broad public interest determination, FERC functionally treated DOE/FE's decision as already made. As such, in its alternatives analysis, FERC summarily rejected the "no-action" alternative because "the no-action alternative could not meet the purpose and need for the Project." Sabine Pass EA at 3-1. This statement is incoherent, if FERC truly understood DOE/FE not to have made a decision. DOE/FE is, after all, considering *whether* to allow gas exports. Because that decision has *not* been made, it is wholly appropriate to selected a "no-action" alternative (including, for FERC, a decision not site a facility whose exports have not been permitted). The fact that FERC felt that it was not free to do so indicates that conditional approvals in fact tend to limit alternatives and steer the development decisionmaking process.

To avoid this illegal effect, DOE/FE therefore may not approve the Jordan Cove export proposal, conditionally or not, until it has considered all alternatives to doing so through the NEPA and Natural Gas Act processes.

2. DOE/FE Must Consider an Adequate Range of Alternatives

Both NEPA and the Natural Gas Act require DOE/FE fully to consider alternatives to Jordan Cove's proposal. Specifically, the public interest analysis requires an "exploration of all issues relevant to the 'public interest'," an inquiry which the Supreme Court held in *Udall* must be wide-ranging. In that case, which concerned hydropower, the regulatory agency was required to consider, for instance, "alternate sources of power," the state of the power market generally, and options to mitigate impacts on wildlife. Here, likewise, DOE/FE must consider alternatives to the export proposal which would better serve the public interest, broadly analyzing other approaches to structuring LNG exports and gas use generally, given exports' sweeping effects on the economy.

NEPA is designed to support this sort of broad consideration. The alternatives analysis is "the heart of the environmental impact statement," presenting sharply defined issues which offer "clear basis for choice among options by the decisionmaker and the public." 40 C.F.R. § 1502.14. Crucially, the alternatives must include "reasonable alternatives not within the jurisdiction of the lead agency," – meaning that DOE/FE must review actions which it cannot directly order – and must include "appropriate mitigation measures not already included in the proposed action or alternatives." *Id.* Because alternatives are so central to decisionmaking and mitigation, "the existence of a viable but unexamined alternative renders an environmental impact statement inadequate." *Oregon Natural Desert Ass'n*, 625 F.3d at 1122 (internal alterations and citations omitted).

Without limiting this consideration, these alternatives should include, at a minimum, consideration of the following:

(1) Whether, consistent with the Energy Information Administration's study titled *Effect of Increased Natural Gas Exports on Domestic Energy Markets* (Jan. 19, 2012) ("*EIA Study*"),[10] exports, if allowed, should move forward in smaller quantities or a slower time table to mitigate the domestic economic and environmental impacts associated with large export volumes or rapid export schedules;

(2) Whether export from other locations would better serve the public interest by mitigating economic or environmental impacts or by limiting the cumulative impacts of multiple terminals located in one region (*i.e.*, the Gulf Coast);[11]

(3) Whether limitations on the sources of exported gas – e.g., limiting export from particular plays, formations, or regions – would help to mitigate environmental and economic impacts;

(4) Whether to condition export on the presence of an adequate regulatory framework, including the fulfillment of the recommendations for safe production made by the DOE's Shale Gas Subcommittee, would better serve the public interest by ensuring that the production increases associated with export will not increase poorly-regulated unconventional gas production;

(5) Whether to delay, deny, or condition exports based upon their effect on the U.S. utility market (including changes in air pollution emissions associated with the impacts of increased export demand on fuel choice);

(6) Whether to require exporters to certify that any unconventional gas produced as a result of their proposal (or shipped through their facilities) has been produced in accordance with all relevant environmental laws and according to a set of best production practices (such as that discussed by the DOE's Shale Gas Subcommittee);

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[10] Attached as Exhibit 5.

[11] Jordan Cove cannot argue that export from other locations would not meet the purpose and need of its proposal. In discussing predictions of price impacts of exports, Jordan Cove argues that notwithstanding the high volume of exports currently proposed, market forces will lead to a much smaller volume of exports. Application at 15-18. This argument assumes that the various export proposals are interchangeable, and thus, that they can meet the same broad purpose and need. Of course, NEPA requires DOE/FE to conduct a principled evaluation of the environmental impacts of the various export possibilities, rather than blindly throwing the decision to "the market."

(7) Whether to deny export proposals all together as contrary to the public interest.

Other alternatives are, no doubt, also available, but DOE/FE must at a minimum consider the possibilities listed above, as they are reasonable and bear directly on the public interest determination before it.

3. DOE/FE Must Fully Analyze the Direct, Indirect, and Cumulative Impacts of Increased Gas Production Linked to Gas Exports from the Proposed Jordan Cove Facility

Jordan Cove argues that the greatest benefits of its proposal will stem from stimulation of additional natural gas production. Environmental impacts of this increased production, including "growth inducing effects," are thus manifestly "reasonably foreseeable" indirect effects of Jordan Cove's proposal. Environmental effects of therefore production must be included in the NEPA analysis. *See* 40 C.F.R. § 1508.8. These effects will be added to the effects of gas production (and other environmental burdens from other industries) already present in the gas plays which Jordan Cove affects, along with any induced production associated with other export proposals. DOE/FE must fully describe all of these effects and develop alternatives which would avoid them, including the alternative of denying Jordan Cove's application, limiting exports to a smaller quantity, or imposing environmental controls on gas produced for export.[12]

Although this requirement is clear on the face of the statute and binding regulations, it is also clear on the NEPA case law. As the Ninth Circuit Court of Appeals recently explained:

> Because "NEPA places upon an agency the obligation to consider every significant aspect of the environmental impact of a proposed action," *Vt. Yankee Nuclear Power Corp. v. Natural Res. Def. Council*, [435 U.S. 519, 553 (1978)], the considerations made relevant by the substantive statute driving the proposed action must be addressed in NEPA analysis.

Oregon Natural Desert Ass'n v. Bureau of Land Management, 625 F.3d 1092, 1109 (9th Cir. 2010). DOE/FE is determining whether or not gas exports are in the "public

[12] Thus, the EIS must address each of the many impacts we discuss below. Likewise, appropriate ESA and NHPA analysis must address these impacts as they bear upon ESA- and NHPA-protected resources.

interest," a term which the Supreme Court has repeatedly held includes consideration of environmental impacts. *Nat'l Ass'n for the Advancement of Colored People v. Federal Power Commission*, 425 U.S.at 670 n.4; *Udall v. Federal Power Comm'n*, 387 U.S. at 450. Thus, just as DOE/FE must consider upstream environmental impacts in its Natural Gas Act determination, so, too, it must analyze and disclose these impacts in the NEPA analysis that will support its final determination.

Infrastructure projects, like Jordan Cove's proposal, that enable resource extraction activities to expand upstream naturally must fully analyze those impacts in the NEPA framework. In *Northern Plains Resource Council v. Surface Transportation Board*, 668 F.3d 1067, 1081-82 (9th Cir. 2011), for instance, the Court considered a railway line which was developed in order to expand coal production at several mines. *Id.* It held that the Surface Transportation Board's NEPA analysis for the line was illegal because the Board had refused to consider the mines' impacts. The Court held that such impacts were plainly "reasonably foreseeable" – and, indeed, were the premise for the construction project in the first place. *Id.* They therefore had to be considered in the NEPA analysis. The same analysis applies here. Upstream gas production is the proffered the justification for Jordan Cove's proposal, and is a reasonably foreseeable result of Jordan Cove's exports. DOE/FE must therefore fully account for this production in an EIS for its decision.

DOE's own earlier efforts provide a useful example. In its 2005 Final Environmental Impact Statement (EIS) for the Imperial-Mexicali 230-kV Transmission Lines, DOE was considering, as it is here, whether it was in the public interest to construct new infrastructure which directly enabled substantial upstream environmental impacts. The Imperial-Mexicali EIS considers the impacts of a transmission line which would enable the operation of two Mexican power plants serving the U.S. market. Although DOE initially attempted to avoid considering the impacts of those plants, confining its analysis to the line itself, it was corrected by court order. *See Border Power Plant Working Group v. Department of Energy*, 260 F.Supp.2d 997 (S.D.Cal. 2003). The final EIS on remand accordingly reviews both the transmission project and the upstream impacts of the plants to the extent they affected the U.S., including ways to mitigate those impacts.[13] *See, e.g.*, Final EIS at 4-43- 4-65 (analysis of air quality impacts and mitigation measures).

We offer no particular view as to the technical merits of that analysis, but the approach used there -- namely, a description of induced upstream impacts coupled with consideration of alternative ways to mitigate them – is generally appropriate for considering the upstream production impacts of LNG export. Indeed, the LNG case is simpler, because the upstream effects are domestic. Thus, unlike in the Imperial-

[13] The final EIS is available at: http://energy.gov/nepa/downloads/eis-0365-final-environmental-impact-statement

Mexicali case, DOE need not partition foreign from U.S. impacts, nor be concerned that certain mitigation measures proposed for another jurisdiction will not be enforceable. *See* 70 Fed. Reg. 21,189, 21,195 (Apr. 25, 2005) (Record of Decision for the Imperial-Mexicali line, expressing some of these concerns). If DOE could manage the complex international issues inherent in the earlier EIS, it can certainly adequately consider the domestic production impacts chiefly at issue here

Analysis of the environmental impacts of induced gas production does not require knowledge of the precise sites where additional production will occur. Even if the particular impacts of a well at a given point in the landscape are difficult to predict at this stage, many of the impacts of increased production, such greenhouse gas emissions, impacts on regional air quality, and water consumption in overtaxed basins, are not dependent on the precise location where drilling occurs. Even for those impacts that are more closely tied to a specific location, such as habitat fragmentation, DOE/FE can and must acknowledge that the impact will occur, including an estimate of the severity of the impact averaged across potential locations.

The appropriateness of such averaging is demonstrated by Jordan Cove's own arguments asserting economic benefits. Jordan Cove asserts that its project will induce additional natural gas production, and that "all of the gas to be exported from Jordan Cove's terminal is likely to be sources from Canadian and U.S. Rocky Mountain supply basins." Application at 5.[14] Jordan Cove claims that induced production will benefit the economy, but Jordan Cove does not predict the individual well sites where this economically stimulating activity will occur. DOE/FE cannot apply a more stringent standard of foreseeability in assessing effects that will be detrimental to the public interest. It cannot count the purported benefits of export and then simply refuse to count the costs. Rather, just as economic activity can be estimated in the aggregate, so, too, can environmental costs (and the economic costs which accompany them). The net increases in, for instance, air pollution associated with the number of wells required to supply Jordan Cove with its export volumes can be quantified based on EPA's emissions inventories, for instance. The net volumes of waste similarly can be derived from industry reports and state discharge figures. And these impacts can be localized, at a minimum, by region. To the extent that Jordan Cove, for instance, anticipates receiving the bulk of its supply from certain fields, or bases its economic benefit models on increased production in those areas, the impacts can be attributed to them as well. At bottom, nominal uncertainties cannot be used to defeat the core – and obvious – point that LNG export will increase the impacts and extent of shale gas production, or DOE/FE's duty to account for these impacts.

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[14] Although Jordan Cove predicts that exported LNG will initially be provided mainly from Canadian sources, Jordan Cove asserts that this will shift to majority US sources over time. Application Appendix A p.3

DOE/FE has not yet undertaken any of this analysis for LNG. On the contrary, the only NEPA analysis which has been generated for this wave of LNG exports, the Environmental Assessment (EA) in the Sabine Pass export case, has come from FERC, and has not provided the information DOE/FE needs to make its decisions, and which it is legally obligated to consider. As we observed in our comments on that EA,[15] FERC, the lead agency, failed even to acknowledge the upstream impacts of the facility. FERC expressed its view that export proposals' inducement of additional drilling, and the environmental effects thereof, is not reasonably foreseeable and outside the scope of FERC's NEPA obligations. *See, e.g., Order Denying Rehearing and Stay re: Sabine Pass Liquefaction, LLC*, 140 FERC ¶ 61,076 (July 26, 2012).

For the reasons stated above, Sierra Club disagrees with FERC's conclusion on this matter. But whatever the merits of FERC's view of the scope of its analytic obligations, DOE/FE retains an independent obligation to consider the upstream impacts of gas production. As even FERC recognizes, DOE/FE's obligations are distinct from FERC's, *id.* P 21 n.25, and DOE/FE has an independent obligation to ensure NEPA compliance, *id.* P 32 n.39 (citing 40 C.F.R. § 1506.3 (2011) and *CEQ Forty Most Asked Questions Concerning CEQ's NEPA Regulations*, Q. 30, 46 Fed. Reg. 18,026 (March 23, 1981)). Moreover, DOE/FE's duties necessarily sweep in these impacts; although FERC should have considered the upstream impacts of its facility siting decision, DOE/FE is considering exports as a whole, making proper analytic breadth all the more crucial. DOE's analysis plainly must consider the full upstream impacts of gas export because the presence or absence those impacts turns upon DOE/FE's licensing decision, and is a key consideration for the public interest determination. If the NEPA analysis is to fully support DOE/FE's final decision, and to adequately present the environmental costs and benefits of that decision and alternatives to it, it must fully disclose these impacts.

[15] Attached as Exhibit 6. We incorporate those comments in full by reference.

4. **DOE/FE Must Also Analyze the Impacts of The Proposed Pipeline and Terminal**

For similar reasons, both NEPA review and DOE/FE's public interest determination must consider the impacts of the construction and operation of the pipeline, liquefaction facilities, terminal, and other infrastructure Jordan Cove proposes. Although FERC has authority over the licensing of these facilities, they are the obvious consequence of Jordan Cove's requested export authorization, and the environmental impacts of these facilities are therefore indirect effects of the project that must be considered under NEPA. Moreover, Jordan Cove has affirmatively requested that DOE/FE consider this infrastructure in DOE/FE's public interest analysis. Specifically, Jordan Cove's discussion of the economic benefit of its proposal incorporates purported job creation and other economic benefits of the construction and operation of the pipeline and terminal, including the claimed indirect and induced benefit these expenditures will have on the economy. Application at 18-23. Jordan Cove cannot credibly argue that the indirect economic benefits of pipeline construction, for example, are within the purview of DOE/FE's public interest determination but that the environmental effects of the pipeline are outside the scope of this analysis.

5. **A Programmatic EIS is Appropriate**

Finally, we again emphasize that the Jordan Cove proposal is only one of many before DOE/FE. Because the effects of these projects are cumulative, and because each approval alters the price and production effects of exports on the economy, DOE/FE must consider these projects' interactions.

It can best do so by conducting a programmatic EIS considering the impacts of *all* gas export proposals at once. DOE/FE has the discretion to do so, even if it determines that it does not have the duty to do so. *See* 40 C.F.R. § 1508.17(b)(3); *see also* 10 C.F.R. § 1021.330. Such a programmatic EIS would allow DOE/FE, and the public, to understand the impacts of all of these proposals, their interactions, and their cumulative environmental and economic impacts. That understanding would serve improved decisionmaking, and allow DOE/FE, the public, and industry, to identify prudent alternatives to serve the public interest and minimize environmental impacts.

Programmatic EISs are designed to serve precisely this purpose. Rather than proceeding in a piecemeal fashion, DOE/FE must recognize that it is making what is, functionally, a programmatic decision to radically alter the U.S. market and production system by allowing for large-scale LNG export, and conduct an EIS commensurate with the decision it is making, rather than piece-mealing that decision from application to application.

C. Jordan Cove's Proposal Is Inconsistent With The Public Interest

Jordan Cove's proposal is inconsistent with the public interest because it will induce significant environmental and economic harm that outweighs the proposal's benefits. The proposal will induce extensive additional natural gas extraction, primarily from shale gas sources. This extra production will harm air, water, and other environmental resources, while delivering far fewer economic benefits than Jordan Cove asserts. The proposal will also increase domestic gas prices, causing environmentally harmful increases in coal-fired electricity production, increased prices for domestic consumers, and harm to manufacturing industries and the jobs they support. Construction and operation of the terminal itself will impose a variety of local environmental harms. Finally, Jordan Cove's assertion of environmental benefits are overstated for a number of reasons, including Jordan Cove's failure to take into account the lifecycle emissions of natural gas.

1. The Project Will Have Significant Adverse Environmental Impacts Not Discussed in Jordan Cove's Application

Jordan Cove's proposal would impose significant environmental costs. The proposed exports would lead to increased natural gas production, especially from unconventional resources such as shale, which will significantly harm air, water, and landscape impacts. The pipeline, terminal, and other infrastructure necessary to enable export will further harm landscapes, wildlife, and water quality. The proposal would also lead to increased domestic gas prices, which will increase domestic coal use and consequent air and water pollution. Each of these environmental harms translates into economic damage. If pollution sickens people, or restricts their travel, economic productivity will suffer – as it will, more directly, if clean air and water and adequate waste disposal capacity are not available. Similarly, as landscapes are industrialized, tourism, agricultural, forestry, hunting and angling, and other place-dependent industries will suffer. Thus, DOE/FE must both consider these environmental impacts in and of themselves and monetize them to weigh them against other economic harms in the public interest analysis.

a. The Project Will Induce Environmentally Harmful Natural Gas Production

Natural gas production—from both conventional and unconventional sources—is a significant air pollution source, can disrupt ecosystems and watersheds, leads to industrialization of entire landscapes, and presents challenging waste disposal issues. These impacts were recently highlighted by a Subcommittee of the DOE's Secretary of Energy's Advisory Board, which identified "a real risk of serious environmental consequences" resulting from continued expansion of shale gas production. DOE, Secretary of Energy's Advisory Board, *Shale Gas Production Subcommittee Second 90-*

Day Report (Nov. 18, 2011) at 10.[16] These risks are discussed in greater detail below. Although some states and federal agencies are taking steps to limit these harms, these efforts are uncertain and, even if fully implemented, will not eliminate the environmental harms.

Jordan Cove's proposed exports would aggravate these harms by inducing additional gas production. Indeed, inducement of additional production is a key premise underlying Jordan Cove's application. Jordan Cove argues that "[t]he demand created by the exports will stimulate increased revenues and jobs in upstream industries." Application at 9. It asserts that "LNG exports, including those from the Jordan Cove export Project, [] should be seen as instrumental in providing the increase demand *to spur exploration and development of gas shale assets* in North America." *Id.* at 19 (emphasis added). The bulk of the economic benefits Jordan Cove claims rest on predictions of increases in natural gas production. Application at 23 & Appendix E. Jordon Cove predicts that this increased production will primarily come from shale gas. *Id.* at 19, Appendix A 7-16.

Jordan Cove's predictions of increased production (although not its predictions of job growth associated therewith) are supported by the available evidence. The *EIA Study* concluded that across all modeled export scenarios, "[n]atural gas markets in the United States [would] balance in response to increased natural gas exports largely through increased natural gas production." *EIA Study*, 6. EIA concluded that "On average, across all cases and export scenarios, the shares of the increase in total domestic production coming from shale gas, tight gas, [and] coalbed sources are 72 percent, 13 percent, [and] 8 percent," respectively. *Id.* at 11.

Shale gas production (as well as coalbed and tight sands production) requires the controversial practice of hydraulic fracturing, or fracking. *See* Application Appendix A 7-16 (explaining that current production of shale gas plays rests on recent developments in horizontal drilling and hydraulic fracturing technologies). As we explain below, natural gas production in general, and fracking in particular, imposes a raft of environmental problems.

i. Natural Gas Production is a Major Source of Air Pollution

Below, we briefly describe some of the primary air pollution problems caused by the industry. These issues include direct emissions from production equipment and indirect emissions, caused by natural gas replacing cleaner energy sources. EPA has moved to correct some of these problems with new air regulations finalized this year, but as we later discuss, these standards do not fully address the problem. DOE/FE must therefore consider the air pollution impacts of increased natural gas production even if EPA's rules are finalized.

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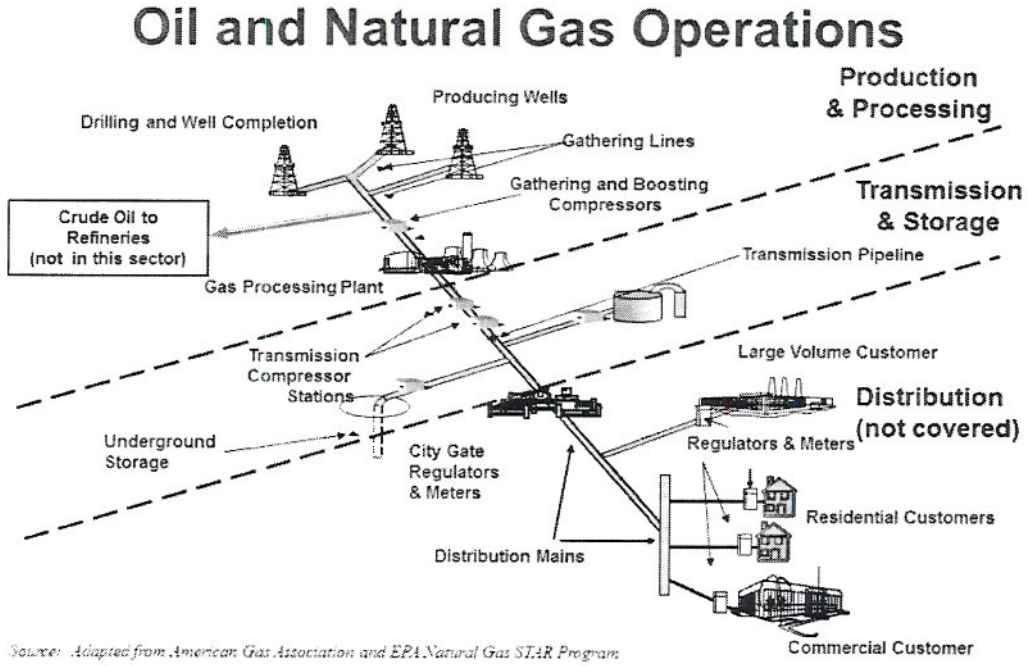
[16] Attached as Exhibit 7. The Board's First 90-Day Report is attached as Exhibit 8.

1. Air Pollution Problems from Natural Gas

Oil and gas operations emit methane (CH_4), volatile organic compounds (VOCs), nitrogen oxides (NO_x), sulfur dioxide (SO_2), hydrogen sulfide (H_2S), and particulate matter (PM_{10} and $PM_{2.5}$). Oil and natural gas operations also emit listed hazardous air pollutants (HAPs) in significant quantities, and so contribute to cancer risks and other acute public health problems. Pollutants are emitted during all stages of natural gas development, including (1) oil and natural gas production, (2) natural gas processing, (3) natural gas transmission, and (4) natural gas distribution.[17] Within these development stages, the major sources of air pollution include wells, compressors, pipelines, pneumatic devices, dehydrators, storage tanks, pits and ponds, natural gas processing plants, and trucks and construction equipment.

Figure 1: The Oil and Natural Gas Sector



Source: Adapted from American Gas Association and EPA Natural Gas STAR Program

There is strong evidence that emissions from natural gas production are higher than have been commonly understood. In particular, a recent study by a consortium of researchers led by the National Ocean and Atmospheric Administration (NOAA) Earth System Research Laboratory recorded pollution concentrations near gas fields substantially greater than EPA estimates would have predicted. That research

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[17] EPA, Oil and Natural Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution, Background Technical Support Document for the Proposed Rules ("TSD") at 2-4 (July 2011), attached as Exhibit 9.

monitored air quality around oil and gas fields.[18] It observed high levels of methane, propane, benzene, and other volatile organic compounds, in the air around the fields. The researchers write that their "analysis suggests that the emissions of the species we measured" – that is the cancer-causing, smog-forming, and climate-disrupting pollutants released from these operations – "are most likely underestimated in current inventories," perhaps by as much as a factor of two.[19]

These emissions have dire practical consequences. A second research team, led by the Colorado School of Public Health, measured benzene and other pollutants released from unconventional well completions.[20] Elevated levels of these pollutants correspond to increased cancer risks for people living within half of a mile from a well[21] – a very large population which will increase as drilling expands.

The many pollutants the industry emits have serious global, regional, and local impacts, as we detail below:

Methane: Methane is the dominant pollutant from the oil and gas sector. Emissions occur as result of intentional venting or unintentional leaks during drilling, production, processing, transmission and storage, and distribution. For example, methane is emitted when wells are completed and vented, as part of operation of pneumatic devices and compressors, and as a result of leaks (fugitive emissions) in pipelines, valves, and other equipment. EPA has identified natural gas systems as the "single largest contributor to United States anthropogenic methane emissions."[22] The industry is responsible for over 40% of total U.S. methane emissions.[23] Methane causes harm both because of its contributions to climate change and as an ozone precursor.

Beginning with climate change, methane is a potent greenhouse gas that contributes substantially to global climate change. Methane has at least 25 times the global warming potential of carbon dioxide over a 100 year time frame and at least 72 times

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[18] G. Petron *et al.*, *Hydrocarbon emissions characterization in the Colorado Front Range: A pilot study*, 117 J. of Geophysical Research 4304, DOI 10.1029/2011JD016360 (2012), attached as Exhibit 10.

[19] *Id.* at 4304.

[20] L. McKenzie *et al.*, *Human Health Risk Assessment of Air Emissions from Development of Unconventional Natural Gas Resources*, Science of the Total Environment (In Press, Mar. 22, 2012), attached as Exhibit 11.

[21] *Id.* at 2.

[22] 76 Fed. Reg. 52,738, 52,792 (Aug. 23, 2011) (EPA proposed air rules for oil and gas production sector), attached as Exhibit 12.

[23] *Id.* at 52,791–92.

the global warming potential of carbon dioxide over a 20-year time frame.[24] The oil and gas production industry's methane emissions amount to 5% of all carbon dioxide equivalent (CO_2e) emissions in the country.[25]

Because of methane's effects on climate, EPA has found that methane, along with five other well-mixed greenhouse gases, endangers public health and welfare within the meaning of the Clean Air Act.[26] The impacts of climate change caused by methane and other greenhouse gases include "increased air and ocean temperatures, changes in precipitation patterns, melting and thawing of global glaciers and ice, increasingly severe weather events, such as hurricanes of greater intensity and sea level rise."[27] A warming climate will also lead to loss of coastal land in densely populated areas, shrinking snowpack in Western states, increased wildfires, and reduced crop yields.[28] More frequent heat waves as a result of global warming have already affected public health, leading to premature deaths. And threats to public health are only expected to increase as global warming intensifies. For example, a warming climate will lead to increased incidence of respiratory and infectious disease, greater air and water pollution, increased malnutrition, and greater casualties from fire, storms, and floods.[29] Vulnerable populations—such as children, the elderly, and those with existing health problems—are the most at risk from these threats.

Methane also reacts in the atmosphere to form ozone.[30] As we discuss below, ozone is a major public health threat, linked to a wide range of maladies. Ozone can also damage vegetation, agricultural productivity, and cultural resources. Ozone is also a significant greenhouse gas in its own right, meaning that methane is doubly damaging to climate – first in its own right, and then as an ozone precursor.

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[24] *IPCC 2007—The Physical Science Basis*, Section 2.10.2, and *IPCC 2007- Summary for Policymakers*, attached as Exhibit 13. We note that these global warming potential figures may be revised upward in the next IPCC report. A more recent study by Shindell *et al.* estimates methane's 100-year GWP at 33; this same source estimates methane's 20-year GWP at 105.

[25] 76 Fed. Reg. 52,738 at 52,791–92.

[26] EPA, Endangerment and Cause or Contribute Findings for Greenhouse Gases, 74 Fed. Reg. 66,496, 66,516 (Dec. 15, 2009) ("Endangerment Finding"), attached as Exhibit 14.

[27] 76 Fed. Reg. at 52,791-22 (citing U.S. EPA, 2011 U.S. GREENHOUSE GAS INVENTORY REPORT EXECUTIVE SUMMARY (2011), attached as Exhibit 15).

[28] *Id.* at 66,532–33.

[29] EPA, *Climate Change, Health and Environmental Effects*, *available at* http://epa.gov/climatechange/effects/health.html, attached as Exhibit 16.

[30] 76 Fed. Reg. at 52,791.

Volatile Organic Compounds (VOCs) and NO_x: The gas industry is a major source of the ozone precursors VOCs and NO_x.[31] VOCs are emitted from well drilling and completions, compressors, pneumatic devices, storage tanks, processing plants, and fugitives from production and transmission.[32] The primary sources of NO_x are compressor engines, turbines, and other engines used in drilling and hydraulic fracturing.[33] NO_x is also produced when gas is flared or used for heating.[34] VOCs and NO_x contribute to the formation of ground-level ozone (also referred to as smog). Smog pollution harms the respiratory system and has been linked to premature death, heart failure, chronic respiratory damage, and premature aging of the lungs.[35] Smog may also exacerbate existing respiratory illnesses, such as asthma and emphysema, or cause chest pain, coughing, throat irritation and congestion. Children, the elderly, and people with existing respiratory conditions are the most at risk from ozone pollution.[36]

Significant ozone pollution also damages plants and ecosystems.[37] Ozone also contributes substantially to global climate change over the short term. According to a recent study by the United Nations Environment Program (UNEP), behind carbon

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[31] *See, e.g.*, EPA Fact Sheet at 3; Al Armendariz, Emissions from Natural Gas Production in the Barnett Shale Area and Opportunities for Cost-Effective Improvements (Jan. 26, 2009), available at http://www.edf.org/documents/9235_Barnett_Shale_Report.pdf (hereinafter "Barnett Shale Report") at 24, attached as Exhibit 17.

[32] *See, e.g.*, TSD at 4-7, 5-6, 6-5, 7-9, 8-1; *see also* Barnett Shale Report at 24.

[33] *See, e.g.*, TSD at 3-6; See also Barnett Shale Report at 24. Air Quality Impact Analysis Technical Support Document for the Revised Draft Supplemental Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project at 11 (Table 2.1).

[34] TSD at 3-6; Colorado Department of Public Health and Environment, *Colorado Visibility and Regional Haze State Implementation Plan for the Twelve Mandatory Class I Federal Areas in Colorado*, Appendix D at 1 (2011), available at http://www.cdphe.state.co.us/ap/RegionalHaze/AppendixD/4-FactorHeaterTreaters07JAN2011FINAL.pdf, attached as Exhibit 18.

[35] RIA at 4-25; Jerrett *et al.*, *Long-Term Ozone Exposure and Mortality*, New England Journal of Medicine (Mar. 12, 2009), *available at* http://www.nejm.org/doi/full/10.1056/NEJMoa0803894#t=articleTop, attached as Exhibit 19.

[36] *See* EPA, *Ground-Level Ozone, Health Effects, available at* http://www.epa.gov/glo/health.html attached as Exhibit 20. EPA, Nitrogen Dioxide, Health, available at http://www.epa.gov/air/nitrogenoxides/health.html, attached as Exhibit 21.

[37] RIA at 4-26.

dioxide and methane, ozone is now the third most significant contributor to human-caused climate change.[38]

As a result of significant VOC and NO_x emissions associated with oil and gas development, numerous areas of the country with heavy concentrations of drilling are now suffering from serious ozone problems. For example, the Dallas Fort Worth area in Texas is home to substantial oil and gas development. Within the Barnett shale region, as of September 2011, there were more than 15,306 gas wells and another 3,212 wells permitted.[39] Of the nine counties surrounding the Dallas Forth Worth area that EPA has designated as "nonattainment" for ozone, five contain significant oil and gas development.[40] A 2009 study found that summertime emissions of smog-forming pollutants from these counties were roughly comparable to emissions from motor vehicles in those areas.[41]

Oil and gas development has also brought serious ozone pollution problems to rural areas, such as western Wyoming.[42] On March 12, 2009, the governor of Wyoming recommended that the state designate Wyoming's Upper Green River Basin as an ozone nonattainment area.[43] The Wyoming Department of Environmental Quality conducted an extended assessment of the ozone pollution problem and found that it was "primarily due to local emissions from oil and gas . . . development activities: drilling,

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[38] *Id. See also* United Nations Environment Programme and World Meteorological Organization, (2011): *Integrated Assessment of Black Carbon and Tropospheric Ozone: Summary for Decision Makers* (hereinafter "UNEP Report," available at http://www.unep.org/dewa/Portals/67/pdf/Black_Carbon.pdf), at 7, attached as Exhibit 22.

[39] Texas Railroad Commission, http://www.rrc.state.tx.us/data/fielddata/barnettshale.pdf (Accessed Nov. 21, 2011), attached as Exhibit 23.

[40] Barnett Shale Report at 1, 3.

[41] *Id.* at 1, 25-26.

[42] Schnell, R.C, *et al.* (2009), "Rapid photochemical production of ozone at high concentrations in a rural site during winter," *Nature Geosci.* 2 (120 – 122). DOI: 10.1038/NGEO415, attached as Exhibit 24.

[43] *See* Letter from Wyoming Governor Dave Freudenthal to Carol Rushin, Acting Regional Administrator, USEPA Region 8, (Mar. 12, 2009) ("Wyoming 8-Hour Ozone Designation Recommendations"), *available at* http://deq.state.wy.us/out/downloads/Rushin%20Ozone.pdf, attached as Exhibit 25; Wyoming Department of Environmental Quality, Technical Support Document I for Recommended 8-hour Ozone Designation of the Upper Green River Basin (March 26, 2009) ("Wyoming Nonattainment Analysis"), at vi-viii, 23-26, 94-05, *available at* http://deq.state.wy.us/out/downloads/Ozone%20TSD_final_rev%203-30-09_jl.pdf, attached as Exhibit 26.

production, storage, transport, and treating."[44] Last winter alone, the residents of Sublette County suffered thirteen days with ozone concentrations considered "unhealthy" under EPA's current air-quality index, including days when the ozone pollution levels exceeded the worst days of smog pollution in Los Angeles.[45] Residents have faced repeated warnings regarding elevated ozone levels and the resulting risks of going outside.[46]

Ozone problems are mounting in other Rocky Mountain states as well. Northeastern Utah recorded unprecedented ozone levels in the Uintah Basin in 2010 and 2011. In the first three months of 2010—which was the first time that winter ozone was monitored in the region—air quality monitors measured more than 68 exceedances of the federal health standard. On three of these days, the levels were almost twice the federal standard.[47] Between January and March 2011, there were 24 days where the National Ambient Air Quality Standard (NAAQS) for ozone were exceeded in the area. Again, ozone pollution levels climbed to nearly twice the federal standard.[48] The Bureau of

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[44] Wyoming Nonattainment Analysis at viii.

[45] EPA, *Daily Ozone AQI Levels in 2011 for Sublette County, Wyoming, available at* http://www.epa.gov/cgi-bin/broker?msaorcountyName=countycode &msaorcountyValue=56035&poll=44201&county=56035&msa=-1&sy=2011&flag=Y &_debug=2&_service=data&_program=dataprog.trend_tile_dm.sas, attached as Exhibit 27; *see also* Wendy Koch, *Wyoming's Smog Exceeds Los Angeles' Due to Gas Drilling*, USA Today, *available at* http://content.usatoday.com/communities/greenhouse/post/2011/03/wyomings-smog-exceeds-los-angeles-due-to-gas-drilling/1, attached as Exhibit 28.

[46] *See, e.g., 2011 DEQ Ozone Advisories*, Pinedale Online! (Mar. 17, 2011) (documenting ten ozone advisories in February and March 2011), *available at* http://www.pinedaleonline.com/news/2011/03/OzoneCalendar.htm, attached as Exhibit 29; Wyoming Department of Environmental Quality, Ozone Advisory for Monday, Feb. 28, Pinedale Online! (Feb. 27, 2011), *available at* http://www.pinedaleonline.com/news/2011/02/OzoneAdvisoryforMond.htm, attached as Exhibit 30.

[47] Scott Streater, *Air Quality Concerns May Dictate Uintah Basin's Natural Gas Drilling Future*, N.Y. TIMES, Oct. 1, 2010, *available at* http://www.nytimes.com/gwire/2010/10/01/01greenwire-air-quality-concerns-may-dictate-uintah-basins-30342.html, attached as Exhibit 31.

[48] *See* EPA, AirExplorer, Query Concentrations (Ozone, Uintah County, 2011), available at http://www.epa.gov/cgi-bin/htmSQL/mxplorer/query_daily.hsql?msaorcountyName=countycode&msaorcountyValue=49047&poll=44201&county=49047&site=-1&msa=-1&state=-1&sy=2011&flag=Y&query=download&_debug=2&_service=data&_program=dataprog.query_daily3P_dm.sas, attached as Exhibit 32.

Land Management (BLM) has identified the multitude of oil and gas wells in the region as the primary cause of the ozone pollution.[49]

Rampant oil and gas development in Colorado and New Mexico is also leading to high levels of VOCs and NO_x. In 2008, the Colorado Department of Public Health and Environment concluded that the smog-forming emissions from oil and gas operations exceed vehicle emissions for the entire state.[50] Moreover, significant additional drilling has occurred since 2008. Colorado is now home to more than 46,000 wells.[51] There is also significant development in the San Juan Basin in southeastern Colorado and northwestern New Mexico, with approximately 35,000 wells in the Basin. As a result of this development and several coal-fired power plants in the vicinity, the Basin suffers from serious ozone pollution.[52] This pollution is taking a toll on residents of San Juan County. The New Mexico Department of Public Health has documented increased emergency room visits associated with high ozone levels in the County.[53]

VOC and NOx emissions from oil and gas development are also harming air quality in national parks and wilderness areas. Researchers have determined that numerous "Class I areas" – a designation reserved for national parks, wilderness areas, and other such lands[54] – are likely to be impacted by increased ozone pollution as a result of oil and gas development in the Rocky Mountain region, including Mesa Verde National Park and Weminuche Wilderness Area in Colorado and San Pedro Parks Wilderness Area, Bandelier Wilderness Area, Pecos Wilderness Area, and Wheeler Peak Wilderness Area

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[49] BLM, *GASCO Energy Inc. Uinta Basin Natural Gas Development Draft Environmental Impact Statement* ("GASCO DEIS"), at 3-13, *available at* http://www.blm.gov/ut/st/en/fo/vernal/planning/nepa_/gasco_energy_eis.html, attached as Exhibit 33.

[50] Colo. Dept. of Public Health & Env't, Air Pollution Control Division, Oil and Gas Emission Sources, *Presentation for the Air Quality Control Commission Retreat*, at 3-4 (May 15, 2008), attached as Exhibit 34.

[51] Colorado Oil & Gas Conservation Commission, *Colorado Weekly & Monthly Oil and Gas Statistics*, at 12 (Nov. 7, 2011), available at http://cogcc.state.co.us/ (library—statistics—weekly/monthly well activity), attached as Exhibit 35.

[52] *See Four Corners Air Quality Task Force Report of Mitigation Options*, at vii (Nov. 1, 2007), *available at* http://www.nmenv.state.nm.us/aqb/4C/TaskForceReport.html, attached as Exhibit 36.

[53] Myers *et al.*, *The Association Between Ambient Air Quality Ozone Levels and Medical Visits for Asthma in San Juan County* (Aug. 2007), *available at* http://www.nmenv.state.nm.us/aqb/4c/Documents/SanJuanAsthmaDocBW.pdf, attached as Exhibit 37.

[54] *See* 42 U.S.C. § 7472(a).

in New Mexico.[55] These areas are all near concentrated oil and gas development in the San Juan Basin.[56]

As oil and gas development moves into new areas, particularly as a result of the boom in development of shale resources, ozone problems are likely to follow. For example, regional air quality models predict that gas development in the Haynesville shale will increase ozone pollution in northeast Texas and northwest Louisiana and may lead to violations of ozone NAAQS.[57] Experts also anticipate air quality problems associated with development of the Marcellus shale in the Mid-Atlantic region.[58] In particular, the state of Delaware has conducted an extensive analysis of NOx pollution from the oil and gas sector, in part because Delaware is downwind from the Marcellus gas plays which projects like Jordan Cove's proposal would support.[59] It demonstrates that Delaware and other downwind states will experience significant NOx pollution if production increases without appropriate controls.

Sulfur dioxide: Oil and gas production emits sulfur dioxide, primarily from natural gas processing plants.[60] Sulfur dioxide is released as part of the sweetening process, which removes hydrogen sulfide from the gas.[61] Sulfur dioxide is also created when gas containing hydrogen sulfide (discussed below) is combusted in boilers or heaters.[62]

Sulfur dioxide causes respiratory problems, including increased asthma symptoms. Short-term exposure to sulfur dioxide has been linked to increased emergency room visits and hospital admissions. Sulfur dioxide reacts in the atmosphere to form

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[55] Rodriguez et al., *Regional Impacts of Oil and Gas Development on Ozone Formation in the Western United States*, 59 Journal of the Air and Waste Management Association 111 (Sept. 2009), available at http://www.wrapair.org/forums/amc/meetings/091111_Nox/Rodriguez_et_al_OandG_Impacts_JAWMA9_09.pdf, attached as Exhibit 38.

[56] *Id.* at 1112.

[57] *See* Kemball-Cook et al., *Ozone Impacts of Natural Gas development in the Haynesville Shale* 44 Environ. Sci. Technol. 9357, 9362 (Nov. 18, 2010), attached as Exhibit 39.

[58] Elizabeth Shogren, *Air Quality Concerns Threaten Natural Gas's Image*, National Public Radio (June 21, 2011), *available at* http://www.npr.org/2011/06/21/137197991/air-quality-concerns-threaten-natural-gas-image, attached as Exhibit 40.

[59] *See* Delaware Department of Natural Resources and Environmental Quality, *Background Information Oil and Gas Sector Significant Sources of NOx Emissions* (2011) attached as Exhibit 41.

[60] 76 Fed. Reg. at 52,756.

[61] TSD 3-3 to 3-5.

[62] 76 Fed. Reg. at 52,756.

particulate matter (PM), an air pollutant which causes a great deal of harm to human health.[63] PM is discussed separately below.

Hydrogen sulfide: Some natural gas contains hydrogen sulfide. When hydrogen sulfide levels are above a specific threshold, gas is classified as "sour gas."[64] According to EPA, there are 14 major areas in the U.S., found in 20 different states, where natural gas tends to be sour.[65] All told, between 15 and 20% of the natural gas in the U.S. may contain hydrogen sulfide.[66]

Given the large amount of drilling in areas with sour gas, EPA has concluded that the potential for hydrogen sulfide emissions from the oil and gas industry is "significant."[67] Hydrogen sulfide may be emitted during all stages of development, including exploration, extraction, treatment and storage, transportation, and refining.[68] For example, hydrogen sulfide is emitted as a result of leaks from processing systems and from wellheads in sour gas fields.[69]

Hydrogen sulfide is an air pollutant with toxic properties that smells like rotten eggs and can lead to neurological impairment or death. Long-term exposure to hydrogen sulfide is linked to respiratory infections, eye, nose, and throat irritation, breathlessness, nausea, dizziness, confusion, and headaches.[70] Although hydrogen sulfide was originally included in the Clean Air Act's list of hazardous air pollutants, it was removed with industry support.[71]

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[63] EPA, Sulfur Dioxide, Health, *available at* http://www.epa.gov/air/sulfurdioxide/health.html, attached as Exhibit 42.

[64] 76 Fed. Reg. at 52,756. Gas is considered "sour" of hydrogen sulfide concentration is greater than 0.25 grain per 100 standard cubic feet, along with the presence of carbon dioxide. *Id.*

[65] EPA, Office of Air Quality Planning and Standards, *Report to Congress on Hydrogen Sulfide Air Emissions Associated with the Extraction of Oil and Natural Gas* (EPA-453/R-93-045), at ii (Oct. 1993) (hereinafter "EPA Hydrogen Sulfide Report"), attached as Exhibit 43.

[66] Lana Skrtic, *Hydrogen Sulfide, Oil and Gas, and People's Health* ("Skrtic Report"), at 6 (May 2006), *available at* http://www.earthworksaction.org/pubs/hydrogensulfide_oilgas_health.pdf, attached as Exhibit 44.

[67] EPA Hydrogen Sulfide Report at III-35.

[68] *Id.* at ii.

[69] TSD at 2-3.

[70] EPA Hydrogen Sulfide Report at i.

[71] *See* Pub. L. 102-187 (Dec. 4, 1991). We do not concede that this approval was appropriate. Hydrogen sulfide meets section 112 of the Clean Air Act's standards for listing as a hazardous air pollutant, and should be so regulated.

Hydrogen sulfide emissions from the oil and gas industry are concerning because this pollutant may be harmful even at low concentrations.[72] Although direct monitoring of hydrogen sulfide around oil and gas sources is limited, there is evidence that these emissions may be substantial, and have a serious impact on people's health. For example, North Dakota reported 3,300 violations of an odor-based hydrogen sulfide standard around drilling wells.[73] People in northwest New Mexico and western Colorado living near gas wells have long complained of strong odors, including but not limited to hydrogen sulfide's distinctive rotten egg smell. Residents have also experienced nose, throat and eye irritation, headaches, nose bleeds, and dizziness.[74] An air sample taken by a community monitor at one family's home in western Colorado in January 2011 contained levels of hydrogen sulfide concentrations 185 times higher than safe levels.[75]

Particulate Matter (PM): The oil and gas industry is a major source of PM pollution. This pollution is generated by heavy equipment used to move and level earth during well pad and road construction. Vehicles also generate fugitive dust by traveling on access roads during drilling, completion, and production activities.[76] Diesel engines used in drilling rigs and at compressor stations are also large sources of fine PM/diesel soot emissions. VOCs are also a precursor to formation of $PM_{2.5}$.[77]

PM consists of tiny particles of a range of sizes suspended in air. Small particles pose the greatest health risk. These small particles include "inhalable coarse particles," which are smaller than 10 micrometers in diameter (PM_{10}), and "fine particles" which are less than 2.5 micrometers in diameter ($PM_{2.5}$). PM_{10} is primarily formed from crushing, grinding or abrasion of surfaces. $PM_{2.5}$ is primarily formed by incomplete combustion of fuels or through secondary formation in the atmosphere.[78]

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[72] See James Collins & David Lewis, Report to CARB, Hydrogen Sulfide: Evaluation of Current California Air Quality Standards with Respect to Protections of Children (Sept. 1, 2000), available at http://oehha.ca.gov/air/pdf/oehhah2s.pdf, attached as Exhibit 45.
[73] EPA Hydrogen Sulfide Report at III-35.
[74] See Global Community Monitor, Gassed! Citizen Investigation of Toxic Air Pollution from Natural Gas Development, at 11-14 (July 2011), attached as Exhibit 46.
[75] *Id.* at 21.
[76] *See* BLM, GASCO Energy Inc. Uinta Basin Natural Gas Development Project Draft Environmental Impact Statement, at App. J at 2 (Oct. 2010) ("GASCO DEIS")
[77] RIA at 4-18.
[78] *See* EPA, Particulate Matter, Health, *available at* http://www.epa.gov/pm/health.html, attached as Exhibit 47; BLM, *West Tavaputs Plateau Natural Gas Full Field Development Plan Final Environmental Impact Statement* ("West Tavaputs FEIS"), at 3-19 (July 2010), *available at* http://www.blm.gov/ut/st/en/fo/price/energy/Oil_Gas/wtp_final_eis.html.

PM causes a wide variety of health and environmental impacts. PM has been linked to respiratory and cardiovascular problems, including coughing, painful breathing, aggravated asthma attacks, chronic bronchitis, decreased lung function, heart attacks, and premature death. Sensitive populations, include the elderly, children, and people with existing heart or lung problems, are most at risk from PM pollution.[79] PM also reduces visibility,[80] and may damage important cultural resources.[81] Black carbon, a component of PM emitted by combustion sources such as flares and older diesel engines, also warms the climate and thus contributes to climate change.[82]

PM emissions from the oil and gas industry are leading to significant pollution problems. For example, monitors in Uintah County and Duchesne County, Utah have repeatedly measured wintertime $PM_{2.5}$ concentrations above federal standards.[83] These elevated levels of $PM_{2.5}$ have been linked to oil and gas activities in the Uinta Basin.[84] West Tavaputs FEIS at 3-20. Modeling also shows that road traffic associated with energy development is pushing PM_{10} levels very close to violating NAAQS standards.[85]

2. EPA's Air Rules Will Not Fully Address These Air Pollution Problems

Although EPA's recently finalized new source performance standards and standards for hazardous air pollutants[86] do reduce some of these pollution problems, they will not solve them. The rules, first, do not even address some pollutants, including NO_x, methane, and hydrogen sulfide, so any reductions of these pollutants occur only as co-benefits of the VOC reductions that the rules require.[87] Second, the rules do not control emissions from most transmission infrastructure.[88] Third, existing sources of air pollution are not controlled for any pollutant, meaning that increased use of existing infrastructure will produce emissions uncontrolled by the rules. Fourth, without full

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[79] RIA at 4-19; EPA, Particulate Matter, Health

[80] EPA "Visibility – Basic Information" http://www.epa.gov/visibility/what.html, attached as Exhibit 48.

[81] *See* EPA, Particulate Matter, Health West Tavaputs EIS, at 3-19; RIA at 4-24.

[82] UNEP Report at 6; IPCC (2007) at Section 2.4.4.3.

[83] GASCO DEIS at 3-12.

[84] West Tavaputs FEIS, at 3-20 (July 2010).

[85] *See* GASCO DEIS at 4-27.

[86] *See* EPA, Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants, Final Rule (Apr. 17, 2012), not yet published in the Federal Register, but available at http://www.epa.gov/airquality/oilandgas/actions.html.

[87] *See id.*128-31.

[88] *See, e.g., id.* at 173, 177

enforcement, the rules will not reduce emissions completely. Fifth, the rules will not address important emissions effects of LNG in particular, including LNG exports' tendency to increase the use of coal power. Thus, though DOE/FE might work with EPA to fully understand the emissions levels likely after the rules are fully implemented, it may not rely upon the EPA rules to avoid weighing and disclosing these impacts.

ii. Gas Production Disrupts Landscapes and Habitats

Increased oil and gas production will transform the landscape of regions overlying shale gas plays, bringing industrialization to previously rural landscapes and significantly affecting ecosystems, plants, and animals. These impacts are large, and difficult to manage.

Land use disturbance associated with gas development impacts plants and animals through direct habitat loss, where land is cleared for gas uses, and indirect habitat loss, where land adjacent to direct losses loses some of its important characteristics.

Regarding direct losses, land is lost through development of well pads, roads, pipeline corridors, corridors for seismic testing, and other infrastructure. The Nature Conservancy ("TNC") estimated that in Pennsylvania, "Well pads occupy 3.1 acres on average while the associated infrastructure (roads, water impoundments, pipelines) takes up an additional 5.7 acres, or a total of nearly 9 acres per well pad." TNC, Pennsylvania Energy Impacts Assessment, Report 1: Marcellus Shale Natural Gas and Wind (2010) at 10,[89] *see also id.* at 18. New York's Department of Environmental Conservation reached similar estimates. New York Department of Environmental Conservation's Revised Draft Supplemental General Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, 5-5 (Sept. 2011) (hereinafter "NY RDSGEIS").[90] After initial drilling is completed the well pad is partially restored, but 1 to 3 acres of the well pad will remain disturbed through the life of the wells, estimated to be 20 to 40 years. *Id.* at 6-13. Associated infrastructure such as roads and corridors will likewise remain disturbed. Because these disturbances involve clearing and grading of the land, directly disturbed land is no longer suitable as habitat. *Id.* at 6-68.

Indirect losses occur on land that is not directly disturbed, but where habitat characteristics are affected by direct disturbances. "Adjacent lands can also be impacted, even if they are not directly cleared. This is most notable in forest settings where clearings fragment contiguous forest patches, create new edges, and change habitat conditions for sensitive wildlife and plant species that depend on "interior" forest conditions." TNC, *Pennsylvania Energy Impacts Assessment, Report 1: Marcellus*

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[89] Attached as Exhibit 49.

[90] Available at http://www.dec.ny.gov/energy/75370.html

Shale Natural Gas and Wind at 10. "Research has shown measureable impacts often extend at least 330 feet (100 meters) into forest adjacent to an edge." NY RDSGEIS 6-75.

TNC's study of the impacts of gas extraction in Pennsylvania is particularly telling. TNC mapped projected wells across the state, considering how the wells and their associated infrastructure, including roads and pipelines, interacted with the landscape. TNC's conclusions make for grim reading. It concluded:

- About 60,000 new Marcellus wells are projected by 2030 in Pennsylvania with a range of 6,000 to 15,000 well pads, depending on the number of wells per pad;

- Wells are likely to be developed in at least 30 counties, with the greatest number concentrated in 15 southwestern, north central, and northeastern counties;

- Nearly two thirds of well pads are projected to be in forest areas, with forest clearing projected to range between 34,000 and 83,000 acres depending on the number of number of well pads that are developed. An additional range of 80,000 to 200,000 acres of forest interior habitat impacts are projected due to new forest edges created by well pads and associated infrastructure (roads, water impoundments);

- On a statewide basis, the projected forest clearing from well pad development would affect less than one percent of the state's forests, but forest clearing and fragmentation could be much more pronounced in areas with intensive Marcellus development;

- Approximately one third of Pennsylvania's largest forest patches (>5,000 acres) are projected to have a range of between 1 and 17 well pads in the medium scenario;

- Impacts on forest interior breeding bird habitats vary with the range and population densities of the species. The widely-distributed scarlet tanager would see relatively modest impacts to its statewide population while black-throated blue warblers, with a Pennsylvania range that largely overlaps with Marcellus development area, could see more significant population impacts;

- Watersheds with healthy eastern brook trout populations substantially overlap with projected Marcellus development sites. The state's watersheds ranked as "intact" by the Eastern Brook Trout Joint Venture are concentrated in north central Pennsylvania, where most of these small watersheds are projected to have between two and three dozen well pads;

- Nearly a third of the species tracked by the Pennsylvania Natural Heritage Program are found in areas projected to have a high probability of Marcellus well development, with 132 considered to be globally rare or critically endangered or imperiled in Pennsylvania. Several of these species have all or most of their known populations in Pennsylvania in high probability Marcellus gas development areas.

- Marcellus gas development is projected to be extensive across Pennsylvania's 4.5 million acres of public lands, including State Parks, State Forests, and State Game Lands. Just over 10 percent of these lands are legally protected from surface development.

TNC, *Pennsylvania Energy Impacts Assessment, Report 1: Marcellus Shale Natural Gas and Wind* (2010) at 29.[91] Increased gas production will exacerbate these problems, which is bad news for the state's lands and wildlife, and the hunting, angling, tourism, and forestry industries which depend upon them. Although TNC adds that impacts could be reduced with proper planning, *id.*, more development makes mitigation more difficult. Indeed, the Pennsylvania Department of Conservation and Natural Resources recently concluded that "zero" remaining acres of the state forests are suitable for leasing with surface disturbing activities, or the forests will be significantly degraded. Penn. Dep't of Conservation and Natural Resources, *Impacts of Leasing Additional State Forest for Natural Gas Development* (2011).[92] These costs are not in the public interest.

These effects will harm rural economies and decrease property values, as major gas infrastructure transforms and distorts the existing landscape. They will also harm endangered species in regions where production would increase in response to Jordan Cove's exports. For example, dozens of endangered and threatened species inhabit the Rocky Mountain region where Jordan Cove expects its induced production to occur.[93] Harm to these species and their habitat is, too, against the profound public interest in species conservation, as expressed in the Endangered Species Act and similar statutes.

iii. Gas Production Poses Risks to Ground and Surface Water

As noted above, most of the increased production that would result from Jordan Cove's proposal will be from shale and other unconventional gas sources, and producing gas from these sources requires hydraulic fracturing, or fracking. *See* Application at 16

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[91] See Exhibit 49.

[92] Attached as Exhibit 50.

[93] Moreover, insofar as Jordan Cove will export gas from the Rocky Mountains which would otherwise been sold in other markets, the proposal may lead to increased production in other gas producing regions to offset the diverted Rocky Mountain production.

(explaining that current production of shale gas plays rests on recent developments in horizontal drilling and hydraulic fracturing technologies). Hydraulic fracturing involves injecting a base fluid (typically water),[94] sand or other proppant, and various fracturing chemicals into the gas-bearing formation at high pressures to fracture the rock and release additional gas. Each step of this process presents a risk to water resources. Withdrawal of the water may overtax the water source. Fracking itself may contaminate groundwater with either chemicals added to the fracturing fluid or with naturally occurring chemicals mobilized by fracking. After the well is fracked, some water will return to the surface, composed of both fracturing fluid and naturally occurring "formation" water. This water, together with drilling muds and drill cuttings, must be disposed of without further endangering water resources.

1. Water Withdrawals

The first step is the procurement of water. The precise amount of water varies by the shale formation being fracked; Jordan Cove predicts that its export proposal will induce shale gas development in all of the country's shale gas plays. To use one example formation, fracking a Marcellus Shale well requires between 4 and 5 million gallons of water. TNC, *Pennsylvania Energy Impacts Assessment, Report 1: Marcellus Shale Natural Gas and Wind*, 5.[95] Fresh water constitutes 80% to 90% of the total water used a well even where operators recycle "flowback" water from the fracking of previous well for use in fracking the current one. New York Department of Environmental Conservation's *Revised Draft Supplemental General Environmental Impact Statement on the Oil, Gas*

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[94] The majority of hydraulic fracturing operations are conducted with a water based fracturing fluid. Fracking may also be conducted with oil or synthetic-oil based fluid, with foam, or with gas.

[95] *Accord* New York Department of Environmental Conservation's *Revised Draft Supplemental General Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*, (September 2011) ("Between July 2008 and February 2011, average water usage for high-volume hydraulic fracturing within the Susquehanna River Basin in Pennsylvania was 4.2 million gallons per well, based on data for 553 wells."), *available at* http://www.dec.ny.gov/data/dmn/rdsgeisfull0911.pdf. Other estimates are that as much as 7.2 million gallons of frack fluid may be used in a 4000 foot well bore. NRDC, *et al.*, *Comment on NY RDSGEIS on the Oil, Gas and Solution Mining Regulatory Program* (Jan. 11, 2012) (Attachment 2, Report of Tom Myers, at 10), attached as Exhibit 51 (hereafter *Comment on NY RDSGEIS*).

Water needs in other geological formations vary. See Exhibit 8 at 19 (estimating that nationwide, fracking an individual well requires between 1 and 5 million gallons of water).

and Solution Mining Regulatory Program, 6-13 (Sept. 2011) (hereinafter "NY RDSGEIS").[96]

Water withdrawals can drastically impact aquatic ecosystems and human communities. Reductions in instream flow negatively affect aquatic species by changing flow depth and velocity, raising water temperature, changing oxygen content, and altering streambed morphology. *Id.* 6-3 to 6-4. Even when flow reductions are not themselves problematic, the intake structures can harm aquatic organisms. *Id.* at 6-4. Where water is withdrawn from aquifers, rather than surface sources, withdrawal risks permanent depletion. This risk is even more prevalent with withdrawals for fracking than it is for other withdrawal, because fracking is a consumptive use. Fluid injected during the fracking process is (barring accident) deposited below freshwater aquifers and into sealed formations. *Id.* 6-5; DOE Subcommittee First 90 day report at 19 ("in some regions and localities there are significant concerns about consumptive water use for shale gas development."). Thus, the water withdrawn from the aquifer will be used in a way that provides no opportunity to percolate back down to the aquifer and recharge it.

2. Fracturing

Fracturing poses a serious risk of groundwater contamination. Contaminants include chemicals added to the fracturing fluid and naturally occurring chemicals that are mobilized from deeper formations to groundwater by the fracking process. Contamination may occur through several methods, including where the well casing fails or where the created fractures intersect an existing a poorly sealed well. Although information on groundwater contamination is incomplete, the available research indicates that contamination has already occurred on multiple occasions.

One category of potential contaminants includes chemicals added to the drilling mud and fracturing fluid. The fluid used for slickwater fracturing is typically comprised of more than 98% fresh water and sand, with chemical additives comprising 2% or less of the fluid. NY RDSGEIS 5-40. Chemicals are added as solvents, surfactants, friction reducers, gelling agents, bactericides, and for other purposes. *Id.* 5-49. New York recently identified 322 unique ingredients used in fluid additives, recognizing that this constituted a partial list. *Id.* 5-41. These chemicals include petroleum distillates; aromatic hydrocarbons; glycols; glycol ethers; alcohols and aldehydes; amides; amines; organic acids, salts, esters and related chemicals; microbicides; and others. *Id.* 5-75 to 5-78. Many of these chemicals present health risks. *Id.* Of particular note is the use of diesel, which the DOE Subcommittee has singled out for its harmful effects and recommended be banned from use as a fracturing fluid additive. DOE Subcommittee First 90-Day Report, 25. The minority staff of the House Committee on Energy and Commerce determined that despite diesel's risks, between 2005 and 2009 "oil and gas

[96] Available at http://www.dec.ny.gov/energy/75370.html

service companies injected 32.2 million gallons of diesel fuel or hydraulic fracturing fluids containing diesel fuel in wells in 19 states." Natural Resources Defense Council, Earthjustice, and Sierra Club, *Comments [to EPA] on Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels* (June 29, 2011) at 3 (quoting Letter from Reps. Waxman, Markey, and DeGette to EPA Administrator Lisa Jackson (Jan. 31, 2001) at 1) (hereafter Comment on Diesel Guidance).[97]

Contamination may also result from chemicals naturally occurring in the formation. Flowback and produced water "may include brine, gases (e.g. methane, ethane), trace metals, naturally occurring radioactive elements (e.g. radium, uranium) and organic compounds."DOE Subcommittee first 90 day report at 21; *see also* Comment on NY RDSGEIS (attachment 3, Report of Glen Miller, at 2). For example, mercury naturally occurring in the formation becomes mixed in with water-based drilling muds, resulting in up to 5 pounds of mercury in the mud per well drilled in the Marcellus region. Comment on NY RDSGEIS (attachment 1, Report of Susan Harvey, at 92).

There are several vectors by which these chemicals can reach groundwater supplies. Perhaps the most common or significant are inadequacies in the casing of the vertical well bore. DOE Subcommittee First 90 Day Report, 20. The well bore inevitably passes through geological strata containing groundwater, and therefore provides a conduit by which chemicals injected into the well or traveling from the target formation to the surface may reach groundwater. The well casing isolates the groundwater from intermediate strata and the target formation. This casing must be strong enough to withstand the pressures of the fracturing process--the very purpose of which is to shatter rock. Multiple layers of steel casing must be used, each pressure tested before use, then centered within the well bore. Each layer of casing must be cemented, with careful testing to ensure the integrity of the cementing. Comment on Diesel Guidance, 5-9. Proper casing construction is an elaborate engineering effort, with multiple layers of steel casing (that have been pressure tested), centralizers to center the casing in the well bore, careful cementing of the casing strings (together with testing to ensure the integrity of this cementing). *Id.*

Separate from casing failure, contamination may occur when the zone of fractured rock intersects an abandoned and poorly-sealed well or natural conduit in the rock. Comment on NY RDSGEIS (Attachment 3, Report of Tom Myers, 12 - 15). One recent study concluded, on the basis of geologic modeling, that frack fluid may migrate from the hydraulic fracture zone to freshwater aquifers in less than ten years.[98]

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[97] Attached as Exhibit 52.

[98] Tom Myers, *Potential Contaminant Pathways from Hydraulically Fractured Shale to Aquifers*, Ground Water (Apr. 17, 2012), attaches as Exhibit 53.

Available empirical data indicates that fracking has resulting in groundwater contamination in at least five documented instances. One study "documented the higher concentration of methane originating in shale gas deposits . . . into wells surrounding a producing shale production site in northern Pennsylvania." DOE Subcommittee first 90 day report at 20 (citing Stephen G. Osborn, Avner Vengosh, Nathaniel R. Warner, and Robert B. Jackson, *Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing*, Proceedings of the National Academy of Science, 108, 8172-8176, (2011)). By looking at particular isotopes of methane, this study was able to determine that the methane originated in the shale deposit, rather than from a shallower source. *Id.* The DOE Subcommittee referred to this as "a recent, credible, peer-reviewed study." *Id.* Two other reports "have documented or suggested the movement of fracking fluid from the target formation to water wells linked to fracking in wells." Comment on NY RDSGEIS (Attachment 2, Report of Tom Meyers, 13). "Thyne (2008)[[99]] had found bromide in wells 100s of feet above the fracked zone." *Id.* "The EPA (1987)[[100]] documented fracking fluid moving into a 416-foot deep water well in West Virginia; the gas well was less than 1000 feet horizontally from the water well, but the report does not indicate the gas-bearing formation." *Id.*

More recently, EPA has investigated groundwater contamination in Pavillion, Wyoming and Dimock, Pennsylvania. In Pavillion, EPA's draft report concludes that "when considered together with other lines of evidence, the data indicates likely impact to ground water that can be explained by hydraulic fracturing." EPA, Draft Investigation of Ground Water Contamination near Pavillion, Wyoming (Dec. 2011), at xiii.[101] EPA tested water from wells extending to various depths within the range of local groundwater. At the deeper tested wells, EPA discovered inorganics (potassium, chloride), synthetic organic (isopropanol, glycols, and tert-butyl alcohol), and organics (BTEX, gasoline and diesel range organics) at levels higher than expected. *Id.* at xii. At shallower levels, EPA detected "high concentrations of benzene, xylenes, gasoline range organics, diesel range organics, and total purgeable hydrocarbons." *Id.* at xi. EPA determined that surface pits previously used for storage of drilling wastes and produced/flowback waters were a likely source of contamination for the shallower waters, and that fracturing likely explained the deeper contamination. *Id.* at xi, xiii. Although this is a draft report in an ongoing investigation, an independent expert who reviewed the EPA Pavillon study at

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[99] Dr. Meyers relied on Thyne, G. 2008. *Review of Phase II Hydrogeologic Study.* Prepared for Garfield County, Colorado.

[100] Environmental Protection Agency. 1987. Report to Congress, Management of Wastes from the Exploration, Development, and Production of Crude Oil, Natural Gas, and Geothermal Energy, Volume 1 of 3, Oil and Gas. Washington, D.C., available at nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=20012D4P.txt, attached as Exhibit 54.

[101] Attached as Exhibit 55, available at http://www.epa.gov/region8/superfund/wy/pavillion/EPA_ReportOnPavillion_Dec-8-2011.pdf

the request of Sierra Club and other environmental groups has supported EPA's findings.[102] it demonstrates a possibility of contamination that DOE must consider in its public interest evaluation.

EPA is also investigating groundwater contamination in Dimock, Pennsylvania. EPA Region III, *Action Memorandum - Request for Funding for a Removal Action at the Dimock Residential Groundwater Site* (Jan. 19, 2012).[103] In Dimock, EPA has determined that "a number of home wells in the Dimock area contain hazardous substances, some of which are not naturally found in the environment." *Id.* at 1. Specifically, wells are contaminated with arsenic, barium, bis(2(ethylhexyl)phthalate, glycol compounds, manganese, phenol, and sodium. *Id.* at 3-4. Many of these chemicals are hazardous substances as defined under CERCLA section 101(14); *see also* 40 C.F.R. § 302.4. EPA's determination is based on "Pennsylvania Department of Environmental Protection (PADEP) and Cabot Oil and Gas Corporation (Cabot) sampling information, consultation with an EPA toxicologist, the Agency for Toxic Substances and Disease Registry (ATSDR) Record of Activity (AROA), issued, 12/28/11, and [a] recent EPA well survey effort." *Id.* The PADEP information provided reason to believe that drilling activities in the area led to contamination of these water supplies. Drilling in the area began in 2008, and was conducted using the hazardous substances that have since been discovered in well water. *Id.* at 1, 2. Shortly thereafter methane contamination was detected in private well water. *Id.* at 2. In addition, there were several surface spills in connection with the drilling operation. *Id.* at 1. After the contamination was detected, PADEP entered a consent decree with Cabot which required permanent restoration or replacement of the water supply. *Id.* at 2. Cabot has installed or is installing a "gas mitigation" system for the affected wells. *Id., see also* Agency for Toxic Substances and Disease Registry, *Record of Activity/Technical Assist* (Dec. 28, 2011) at 2 (hereafter ATSDR).[104]

Pursuant to the consent decree, Cabot was providing replacement water to all 18 homes until November 30, 2011, at which point Cabot halted deliver with PADEP's consent. ATSDR at 2. EPA has intervened because "EPA does not know what, if any, hazardous substances these 'gas mitigation' systems, originally designed to address methane, are removing." EPA Action Memorandum at 2. EPA sampled water from 64 home wells.[105],

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[102] Tom Myers, *Review of DRAFT: Investigation of Ground Water Contamination near Pavillion Wyoming* (April 30, 2012), attached as Exhibit 56 and available at http://docs.nrdc.org/energy/files/ene_12050101a.pdf.

[103] Attached as Exhibit 57, available at http://www.epaosc.org/sites/7555/files/Dimock%20Action%20Memo%2001-19-12.PDF

[104] Attached as Exhibit 58, available at http://www.epa.gov/aboutepa/states/dimock.pdf.

[105] EPA, *EPA Completes Drinking Water Sampling in Dimock, Pa* (July 25, 2012), attached as Exhibit 59, and available at http://yosemite.epa.gov/opa/admpress.nsf/0/1A6E49D193E1007585257A46005B61AD

"EPA found hazardous substances, specifically arsenic, barium or manganese, all of which are also naturally occurring substances, in well water at five homes at levels that could present a health concern. In all cases the residents have now or will have their own treatment systems that can reduce concentrations of those hazardous substances to acceptable levels at the tap."[106]

3. Waste Management

Fracturing produces a variety of liquid and solid wastes that must be managed and disposed of. These include the drilling mud used to lubricate the drilling process, the drill cuttings removed from the well bore, the "flowback" of fracturing fluid that returns to the surface in the days after fracking, and produced water that is produced over the life of the well (a mixture of water naturally occurring in the shale formation and lingering fracturing fluid). These wastes contain the same contaminants described in the preceding section. They present environmental hazards with regard to their onsite management and with their eventual disposal.

On site, drilling mud, drill cuttings, flowback and produced water are often stored in pits. Such open pits can have harmful air emissions, can leach into shallow groundwater water, and can fail and result in surface discharges. Many of these harms can be minimized by the use of seal tanks in a "closed loop" system. *See, e.g.*, NY RDSGEIS at 1-12. Presently, only New Mexico mandates the use of closed loop waste management systems, and pits remain in use elsewhere.

Flowback and produced water must ultimately be disposed of offsite. Some of these fluids may be recycled and used in further fracturing operations, but even where a fluid recycling program is used, recycling leaves concentrated contaminants that must be disposed of. The most common methods of disposal are disposal in underground injection wells or through water treatment facilities leading to eventual surface discharge.

Underground injection wells present risks of groundwater contamination similar to those identified above for fracking itself. Gas production wastes are not categorized as hazardous under the Safe Drinking Water Act, 42 U.S.C. § 300f *et seq.*, and may be disposed of in Class II injection wells. Class II wells are brine wells, and the standards and safeguards in place for these wells were not designed with the contaminants found in fracking wastes in mind. *See also* NRDC *et al.*, Petition for Rulemaking Pursuant to Section 6974(a) of the Resource Conservation and Recovery Act Concerning the Regulation of Wastes Associated with the Exploration, Development, or Production of Crude Oil or Natural Gas or Geothermal Energy (Sept. 8, 2010).[107]

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[106] *Id.*

[107] Attached as Exhibit 60.

> or privately owned treatment plant is the observed increases in trihalomethane (THM) concentrations in drinking water reported in the public media (Frazier and Murray, 2011), due to the presence of increased bromide concentrations. Bromide is more reactive than chloride in formation of trihalomethanes, and even though bromide concentrations are generally lower than chloride concentrations, the increased reactivity of bromide generates increased amounts of bromodichloromethane and dibromochloromethane (Chowdhury, et al., 2010). Continued violations of an 80microgram/L THM standard may ultimately require a drinking water treatment plant to convert from a standard and cost effective chlorination disinfection treatment to a more expensive chloramines process for water treatment. Although there are many factors affecting THM production in a specific water, simple (and cheap) dilution of fracture treatment water in a stream can result in a more expensive treatment for disinfection of drinking water. This transfer of costs to the public should not be permitted.

Comment on NY RDSGEIS (attachment 3, Report of Glen Miller, at 13). Similarly, municipal treatment works typically to not treat for radioactivity, whereas produced water can have high levels of naturally occurring radioactive materials. In one examination of three samples of produced water, radioactivity (measured as gross alpha radiation) were found ranging from 18,000 pCi / L to 123,000 pCi/L, whereas the safe drinking water standard is 15 pCi/L. *Id.* (Miller Report at 4).

b. The Project Requires Construction of a 234-mile Pipeline That Will Adversely Affect Water, Wildlife, and Habitat

Exporting LNG from Coos Bay will require construction of the new Pacific Connector Gas Pipeline, as existing infrastructure is incapable of delivering the needed volumes of gas to the proposed terminal site. Application at 4. This 234-mile pipeline will cross 218 water bodies, and require "a compressor station at Butte Falls, in Jackson County; four meter stations, a gas control communication system; 16 mainline block valves, and four pig launchers and receivers."[112] *Id.*

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[112] *Id.*; Environmental Protection Agency, *Comment on Jordan Cove Energy and Pacific Connector Gas Pipeline Project* (June 8, 2009) (hereinafter "EPA Comment on CP07-441), attached as Exhibit 65.

[113] The pipeline will significantly adversely affect water quality, terrestrial habitat, and numerous protected species, as has been recognized by the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the State of Oregon, and numerous Oregon state agencies.

i. Procedural History of the Proposed Pacific Connector Pipeline

While Jordan Cove's present application provides few details regarding this pipeline—or the proposed terminal, discussed in part III.C.1.c below—these facilities were discussed in conjunction with Jordan Cove's prior proposal to import LNG at Coos Bay. In connection with that prior proposal, FERC prepared an EIS regarding construction and operation of the Pacific Connector Gas Pipeline and the Jordan Cove import facility. Application at 4. This EIS was woefully deficient, as we asserted together with numerous other organizations, the State of Oregon, and numerous individuals. When FERC authorized construction of the pipeline and terminal despite these deficiencies, numerous organizations petitioned for rehearing. On April 16 of this year, FERC acted on the various petitions to withdraw this authorization, explaining that FERC's public interest determination rested on assumptions regarding imports that were no longer valid in light of Jordan Cove's switch to exports and the underlying changes in the American gas market. 139 FERC ¶ 61,040 P 22-23 (Apr. 16, 2012).

The record of these prior proceedings reveals two broad truths regarding the pipeline and terminal. First, as explained in numerous comments submitted by government agencies and environmental organizations, determining the full extent of the pipeline's impacts requires a complete picture of the pipeline proposal. For example, the State of Oregon criticized the EIS as containing "only general information and conclusions about environmental and resource effects" and identified numerous specific unanswered factual questions bearing on the effects of the pipeline.[114] The National Marine Fisheries Service and U.S. Fish and Wildlife Service similarly criticized the EIS and concurrent biological assessment as providing too little factual information to support adequate analysis of environmental impacts.[115] Thus, the environmental impacts of the pipeline,

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[113] Final Environmental Impact Statement for the Jordan Cove Liquefied [Natural] Gas (LNG) Terminal and Pacific Connector Gas Pipeline Project, § 4-3.13 (May 1, 2009) (hereinafter "CP07-441 EIS"), *available at* http://www.ferc.gov/industries/gas/enviro/eis/2009/05-01-09-eis.asp . Because of the size of this document, we have not included it as an exhibit here.

[114] State of Oregon, Comments on Jordan Cove Energy Project and Pacific Connector Gas Pipeline, 1 (May 29, 2009) (hereinafter "Oregon Comment on CP07-441"), attached as Exhibit 66.

[115] U.S. Fish and Wildlife Service, *Review of the biological assessment for the Port of Coos Bay slip and access channel, Jordan Cove LNG Terminal, and Pacific Connector Gas*

and accordingly the impact on the public interest, will depend on the details of the pipeline construction, maintenance, and operation. DOE/FE must therefore postpone its evaluation of the public interest until these questions are answered.

Second, although the information in the prior FERC proceeding was incomplete, this information nonetheless demonstrates significant environmental harm arising from the pipeline. Many of these impacts were acknowledged in FERC prepared, and others were highlighted in comments on the EIS. Summarizing this information, the State of Oregon strongly disagreed with FERC's conclusion that the pipeline and terminal would have only "some adverse environmental impacts," explaining that this conclusion "significantly understates the effects of these projects on the environment and important natural resources."[116] Oregon was able to reach this conclusion despite its numerous questions regarding the precise extent of the impacts. These impacts include effects associated with stream crossings, modification of the pipeline right of way, testing of the pipeline, and effects of these three on wildlife. We agree that FERC was arbitrary and unsupported in concluding that the adverse environmental impacts of the pipeline and terminal would be minor and effectively mitigated. We summarize these various adverse environmental effects below.

ii. Stream Crossings and Water Quality Impacts

The proposed Pacific Connector Gas Pipeline would cross 218 water bodies, including 34 water bodies listed as impaired under section 303(d) of the Clean Water Act.[117] To summarize, FERC concluded that the pipeline risked harming water quality through:

> Clearing and grading of streambanks, removal of riparian vegetation, instream trenching, trench dewatering, and backfilling could result in streambank modification, increased sedimentation, turbidity, increase in temperature, decreased dissolved oxygen concentrations, releases of chemical and nutrient pollutants form sediments; and introduction of chemical contaminants, such as fuel and lubricants. An increase in soil compaction and vegetation clearing could potentially increase runoff and subsequent streamflow or peak flows. Surface waters could be impacted due to alteration of groundwater flow where the pipeline intersects waterbodies.[118]

Pipeline projects (July 7, 2009) (hereinafter "USFWS Comment on CP07-441"), attached as Exhibit 67; NMFS Comment on CP07-441, attached as Exhibit 4.

[116] Oregon Comment on CP07-441 at 1.

[117] CP07-441 EIS § 4-3.13.

[118] CP07-441 EIS at 4-3.31

These impacts will be significant. Beginning with temperature, the pipeline will raise stream temperatures by "remov[ing] riparian vegetation, reduc[ing] shade, and increase[ing] the exposure of surface water to radiant energy, including those within riparian reserves."[119] At least two of the affected streams, North Fork Little Butte Creek and South Fork Little Butte Creek, are already listed as temperature impaired pursuant to Clean Water Act 303(d).[120] For the smallest of the streams modeled in the EIS, FERC "predicted initial average temperature changes of 1.0 to 8.6 degrees C."[121] FEIS 4.3-43, see also OR FEIS comment at 29 (criticizing this). Increases in stream temperature can harm protected fish species, including salmonids.[122] The National Marine Fisheries Service concluded that the proposed level of large tree retention near stream crossings was insufficient to protect salmonid habitat, both because of the loss of shade for the water itself and because insufficiently dense forests fail to produce "density dependent mortality of trees, starving the stream[s] of large wood for up to 200 years."[123]

The pipeline will also increase sediment loads in streams, especially in connection with stream crossing. The project proposes to use horizontal directional drilling to pass beneath many streams. When successful, horizontal directional drilling has lower environmental impacts than other forms of stream crossing. Nonetheless, even where horizontal directional drilling succeeds without a "frack out" failure, and even where work in streams is conducted during periods of low seasonal flow, Oregon's past experiences with construction in streams demonstrates work can lead to large unanticipated sediment discharge.[124] Moreover, there is a substantial risk that horizontal directional drilling will fail at some crossings. In particular, the EIS and the comments of the Oregon Department of Fish and Wildlife identify the segments near the Rogue River as having a high potential for failure.[125] The proposal's contingency plan for such a failure calls for an "open-cut" crossing, but as the Oregon Department of Fish and Wildlife explains, this is not "an acceptable alternative due to impacts on fish, fish habitat, the river, as well as impacts to the sport fishery and the economy of upper river communities."[126]

Sediment may also enter streams as a result of "slumping" on "steep slope pipeline approaches (many of the approaches in the Coast Range) . . . for a number of seasons after initial soil excavation and refilling of the trench. These slumps will impact coho,

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[119] *Id.* at 4-3.44.
[120] *Id.*
[121] *Id.* at 4-3.43.
[122] NMFS Comment on CP07-441 at 2.
[123] NMFS Comment on CP07-441 at 2.
[124] Oregon Comment on CP07-441 at 29.
[125] CP07-441 EIS at 4-3.51, 4-5.110 (discussing potential soil liquefaction that could damage pipeline integrity), Oregon Comment on CP07-441 at 42, 45, 60.
[126] Oregon Comment on CP07-441 at 45.

steelhead, and cutthroat populations in the affected stream reaches."[127] OR FEIS comment at 47.

Construction and operation of the pipeline will also introduce fertilizers and herbicides into nearby waterways. In conjunction with efforts to re-vegetate disturbed areas after the pipeline is installed, the operator proposes to use 200 pounds of fertilizer per acre of disturbed area.[128] Runoff of this fertilizer risks impairing water quality.[129]

iii. Hydrostatic Testing

Another vector for impacts to water quality is the proposal for hydrostatic testing of the pipeline. To test the pipeline integrity, the operator proposes to use 59 million gallons of water.[130] We discuss the general impacts of water withdrawals in part III.C.1.a.iii.1 above. In the context of hydrostatic testing, and additional issue is disposal of water after the testing has occurred. Because water is moved along the length of the pipeline in the course of this testing, the process has the potential cause "inter-basin transfer of non-native species,"[131] and can spread pathogens such as P. lateralis, which causes disease in Port-Orford cedars.[132] Discharge of the used water can also spread chemicals found inside the pipeline.[133] The Oregon Department of Fish and Wildlife concluded that "Hydrostatic testing of the pipeline could have large impacts on nesting birds as well as amphibians and reptiles."[134]

iv. Wildlife and Habitat

Finally, the pipeline will impose a variety of other impacts on habitat and wildlife. The proposal calls for clearing timber along the right-of-way corridor. This and other aspects of the pipeline will "impact[]" "Category 1 habitats" including "561 acres of coniferous old growth and late successional forest (a portion of this acreage with spotted owl and marbled murrelet use); 24 acres of vernal pool wetlands; 6 acres of mature oak woodlands; and 3 acres of rare plant habitat."[135] This habitat includes "some of the most important habitats currently available for the survival and recovery for several

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[127] Oregon Comment on CP07-441 at 47.
[128] CP07-441 EIS § 2.4.2.1.
[129] Oregon Comment on CP07-441 at 28.
[130] CP07-441 EIS § 4-3.38. Another 28.25 million gallons needed for hydrostatic testing of LNG storage tanks at terminal. *Id.* § 4-3.21.
[131] NMFS Comment on CP07-441 at 2.
[132] Note that this pathogen has been documented within a tenth of a mile of the proposed pipeline route. CP07-441 EIS § 4.4.2-7.
[133] NMFS Comment on CP07-441 at 2.
[134] Oregon Comment on CP07-441 at 40.
[135] Oregon Comment on CP07-441 at 39.

ESA-listed species, especially the Northern spotted owl [] and marbled murrelet."[136] The U.S. Fish and Wildlife Service stated that it appears the Project will result in removal or degradation of significant acreages of habitat for these species, and adverse impacts to a high number of sites occupied by [them]."[137] As the Oregon Department of Fish and Wildlife explained, "[r]emoval of riparian forest habitat in small amounts [per site] would become a notable factor when looking at the scale of this project."[138] NMFS and EPA similarly criticized the pipeline and terminal as negatively impacting wetlands.[139]

In addition to timber removal, the pipeline risks harming species through noise associated with blasting, pile driving, and other loud activities. The EIS explained that seven waterbodies in the Rogue Basin, for example, would likely require blasting because the streambed substrate is bedrock.[140] Noise from these activities can impact birds, including ospreys, great blue herons, peregrine falcons, bald and golden eagles, spotted owls, and marbled murrelets.[141]

The cleared right-of-way will act as conduit that can increase the spread of fires. The corridor will also provide a tempting route for off-highway vehicle users, despite efforts to introduce barriers to such uses, and these vehicles "have the potential to spread noxious weeds, insects, or diseases."[142]

c. Terminal and Liquefaction Facilities Impose Further Environmental Impacts

Jordan Cove's prior proposal for an import terminal called for, as summarized by EPA:

> an access channel from the existing Coos Bay navigation channel to the terminal; a triple berth slip projected to receive 80 LNG carrier ships per year; interconnecting facilities including piping, electrical, and control systems; two LNG storage tanks with a capacity of 160,000 cubic meters; vapor handling, re-gasification and sendout systems; a natural gas liquids (NGL) extraction facility; a 37-megawatt, natural gas-fired power plant; utilities and

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[136] USFWS Comment on CP07-441 at 2.
[137] *Id.*, *see also id.* at 4-6.
[138] Oregon Comment on CP07-441 at 47.
[139] NMFS Comment on CP07-441 at 2, EPA Comment on CP07-441 at 1-2 (explaining that although the "revised upland route" reduced impacts on wetlands, this route was still inadequate).
[140] CP07-441 EIS § 4-6.68.
[141] Oregon Comment on CP07-441 at 40, USFS Comment on CP07-441 at 19.
[142] CP07-441 EIS § 4-4.42.

other support systems, associated buildings and enclosures.[143]

As the record on the prior proceeding demonstrates, these facilities would have harmed the environment as a result of dredging of the berth and ship channel, stormwater runoff, the intake and discharge of cooling and ballast water, and through ship traffic. The present export proposal would impose the same impacts, as exports will require many of the same facilities. Jordan Cove states that operating the proposed terminal for export will require "Two 160 cubic meter LNG full-containment storage tanks" (which were also proposed for imports) "a single marine berth capable of accommodating LNG vessels up to Q-flex size, and on-site utilities and services. The modified plans include large diameter LNG piping configured for exports and electrically driven liquefaction equipment." Application at 4. In addition, the liquefaction facilities required for export will impose additional impacts not considered in the prior FERC proceeding or acknowledged in Jordan Cove's present application.

To address these impacts in more detail, both EPA and Oregon Department of Fish and Wildlife expressed serious concerns regarding dredging and disposal of dredge materials.[144] EPA stated that the EIS failed to show that there was a site that could be used for disposal of dredging material without adverse impact.[145] Oregon Department of Fish and Wildlife expressed concerns that dredging in the slip area and access channel will affect salinity of the entire bay. "Changes in salinity throughout the bay may affect fish/shellfish distribution in the bay along with spawning and rearing of some fish/shellfish species that use Coos Bay."[146] More broadly, the agency had "concern over the potential ecological effects of future dredging" associated with an LNG terminal.[147]

Ships' water intake and discharge provides a second set of impacts. Water intake risks entraining fish. At the time of the EIS, Jordan Cove did not propose to install fish exclusion screens on its fixed water delivery system. Harmful impacts to fish are likely in the absence of such screens.[148] Conversely, ships' cooling water discharge can harmfully raise the temperature of the surrounding bay waters.[149] Discharge of ships' ballast water provides a vector for transport of exotic or nuisance organisms.[150]

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[143] EPA Comment on CP07-441 at 1.
[144] EPA Comment on CP07-441 at 2, Oregon Comment on CP07-441 at 41-42.
[145] EPA Comment on CP07-441 at 2.
[146] Oregon Comment on CP07-441 at 41-42.
[147] *Id.*
[148] NMFS Comment on CP07-441 at 2, Oregon Comment on CP07-441 at 24.
[149] CP07-441 EIS § 4-3.27. Note that the level of warming from cooling water discharge FERC estimates in this EIS is unexplainedly significantly lower than the amount of warming predicted in other LNG EISs. *See, e.g.*, Bradwood Landing Project

Stormwater runoff from the terminal site will also adversely affect the bay. NMFS criticized the EIS for failing to recognize that "stormwater carries heavy metals, petroleum products and brake chemicals and compounds that are deleterious to fish and fish habitat" and thereby failing to adequately address the impacts of stormwater.[151]

Ship traffic will cause environmental harm. For one, ship traffic causes "resuspension of bottom sediments and resulting increases in turbidity."[152] Although it may be that, as FERC concluded, the resuspension of sediment caused by any individual ship passage lasts only for a "short-term," it may occur nearly every other day: transit of 80 LNG tankers in and out of the terminal every year, with 24 hours required to load a tanker and room for only one tanker to load at time, will mean LNG tanker passage in or out of the harbor on approximately 160 days per year. Ship traffic can also "contribute to localized shoreline erosion due to the development of boat wakes."[153] This is "especially" important "since the Coos Bay navigation channel is very narrow, with steep sides."[154] Separate from effects on water quality, the frequent passage of LNG tankers through the bay, coupled with the large exclusion zones that are maintained around these ships for safety, will significantly disrupt other human users of the bay, including fishermen and recreational boaters.

Air quality will be adversely affected by ship traffic and operation of liquefaction and other facilities. Although Jordan Cove's application includes no information about these impacts, some information regarding the type of impacts associated with LNG export was provided in connection with Sabine Pass LNG's recent application to FERC for a construction and operating permit. *See* Sabine Pass Liquefaction Project, FERC Docket No. CP11-72, Comments of Sierra Club (filed Jan. 30, 2012),[155] Comments of Gulf Coast Environmental Labor Coalition (filed Jan. 27, 2012).[156] We incorporate these comments here by reference. These comments likely understate the impact Jordan Cove's proposed facility would have, however, because they address conversion of an existing LNG import facility, whereas Jordan Cove proposes to construct a new facility.

Final Environmental Impact Statement § 4-164 (June 6, 2008), available at http://www.ferc.gov/industries/gas/enviro/eis/2008/06-06-08-eis.asp

[150] Oregon Comment on CP07-441 at 47.

[151] NMFS Comment on CP07-441 at 2.

[152] CP07-441 EIS § 4.3.2.3

[153] Oregon Comment on CP07-441 at 57-58.

[154] *Id.*

[155] Attached as Exhibit 6.

[156] Attached as **Exhibit 68**

d. The Project Will Induce Some Domestic Electricity Generators to Switch from Gas to Coal, Further Harming the Environment

Jordan Cove's export proposal will further increase air pollution by increasing the about of coal used for domestic electricity production. The EIA predicts that LNG export will increase domestic natural gas prices, including potential wellhead price increases of 10 to 50%. *EIA Study* at 6, 8. As explained in part III.B.4 below, EIA's estimates are superior to those offered by Jordan Cove. These price increases will decrease domestic consumption of natural gas, primarily in the electric power sector. *Id.* at 6.

The EIA Study predicts that exports, by causing natural gas prices to rise, will drive more electricity generation t coal than to renewable energy. EIA Study at 6 (The power sector will "primarily" respond by shifting to coal-fired generation, and only secondarily to renewable sources), *see also id.* at 17 ("higher natural gas prices lead electric generators to burn more coal and less natural gas."). Specifically, EIA predicts that 72 percent of the decrease in gas-fired electricity production will be replaced by coal-fired production, with increased liquid fuel consumption, increased renewable generation, and decreases in total consumption making up the remainder (8, 9, and 11 percent, respectively). *Id.* at 18.

The shift from gas- to coal-fired electricity generation will increase emissions of both traditional air pollutants and greenhouse gases. Gas-fired power plants generate less than a third of the nitrogen oxides and one percent of the sulfur oxides that coal-fired plants generate.[157] Thus, the EIA Study demonstrates that exports will harm the local environment by causing the opposite shift here.

Coal-fired plants also release roughly twice the carbon dioxide as gas-fired plants, *id.*, although as discussed in the following section, it is likely that much of this combustion advantage is offset by the greenhouse gas emissions resulting from gas production. Accordingly, the price increase and corresponding shift to coal-fired power generation risks increasing greenhouse gas pollution. The *EIA Study* examined the effects of 6 or 12 bcf/d of exports, phased in slowly or quickly, together with various estimates for the extent of shale gas reserves and the pace of US economic development. EIA concluded that under every scenario exports would produce a significant increase in domestic greenhouse gas emissions, as illustrated by the table below.

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[157] EPA, Air Emissions, attached as Exhibit 69, available at http://www.epa.gov/cleanenergy/energy-and-you/affect/air-emissions.html

Table 4: Cumulative CO_2 Emissions from 2015 to 2035 With Various Export Scenarios[158]

Case	no added exports	low/slow	low/rapid	high/slow	high/rapid
Reference					
Cumulative carbon dioxide emissions	125,056	125,699	125,707	126,038	126,283
Change from baseline		643	651	982	1,227
Percentage change from baseline		0.5%	0.5%	0.8%	1.0%
High Shale EUR					
Cumulative carbon dioxide emissions	124,230	124,888	124,883	125,531	125,817
Change from baseline		658	653	1,301	1,587
Percentage change from baseline		0.5%	0.5%	1.0%	1.3%
Low Shale EUR					
Cumulative carbon dioxide emissions	125,162	125,606	125,556	125,497	125,670
Change from baseline		444	394	335	508
Percentage change from baseline		0.4%	0.3%	0.3%	0.4%
High Economic Growth					
Cumulative carbon dioxide emissions	131,675	131,862	132,016	131,957	132,095
Change from baseline		187	341	282	420
Percentage change from baseline		0.1%	0.3%	0.2%	0.3%

Source: U.S. Energy Information Administration, National Energy Modeling System, with emissions related to natural gas assumed to be consumed in the liquefaction process included.

The fact that gas exports will tend to favor coal as a fuel for electrical generation has particularly important implications for national emissions control efforts. EPA has just released proposed carbon pollution standards for electricity generating units which set emissions levels based upon the performance of natural gas combined-cycle plants. *See*77 Fed. Reg. 22,392 (Apr. 13, 2012). EPA anticipates no notable compliance costs for the rule because it expects utilities to react to low gas prices, among other factors, by avoiding constructing expensive coal-fired plants. *See id.* at 22,430. If LNG exports move forward, however, gas prices will increase, making it more difficult and expensive to capture combustion-side carbon pollution reductions from fossil-fuel fired power plants. This interference with national efforts to control global warming, which endangers public health and welfare, *see* 74 Fed. Reg. 66,496 (Dec. 15, 2009), is not in the public interest.

e. LNG Exports Are Unlikely to Reduce Global Greenhouse Gas Emissions

Several other export applicants have argued that LNG exports will benefit the environment by allowing importing countries to burn natural gas in place of coal, fuel oil, or other fuels with higher carbon intensities, and that LNG exports will thereby reduce global greenhouse gas emissions. This argument is wrong for two reasons.

[158] From the *EIA Study* at 19.

First, looking at importing countries' response to exports, a recent study by the International Energy Agency predicts that international trade in LNG and other measures to increase global availability of natural gas will lead many countries to use natural gas in place of wind, solar, or other renewables, displacing these more environmentally beneficial energy sources instead of displacing other fossil fuels, and that these countries may also increases their overall energy consumption beyond the level that would occur with exports.[159] In the United States alone, the IEA expects the gas boom to result in a 10% reduction in renewables relative to a baseline world without increased gas use and trade.[160] The IEA goes on to conclude that high levels of gas production and trade will produce "only a small net shift" in global greenhouse gas emissions, with atmospheric CO2 levels stabilizing at over 650 ppm and global warming in excess of 3.5 degrees Celsius, "well above the widely accepted 2°C target." *Id.*

Second, even where importing countries do substitute gas for coal or fuel oil, the available evidence indicates that this substitution is likely to cause little, if any, reduction in global greenhouse gas emissions. On this issue, it is important to highlight the energy and environmental costs LNG incurs in beyond those incurred by domestic gas use. Liquefying natural gas is an energy intensive process. Additional energy is then consumed in the transportation of the gas, with attendant greenhouse gas emissions. Finally, the LNG must be regasified at the import terminal, often by being heated with the combustion of other gas. These operations drastically increase the lifecycle greenhouse gas emissions of LNG, adding between 24.7 and 27.5 tons of CO_2e per MMBtu.[161]

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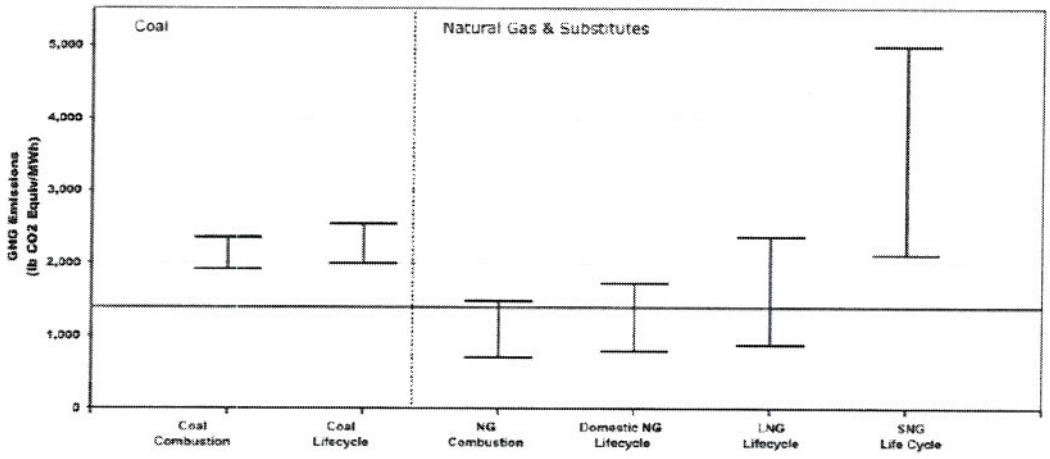
[159] International Energy Agency, *Golden Rules for a Golden Age of Gas*, Ch. 2 p. 91 (2012), attached as Exhibit 70 and available at http://www.iea.org/publications/freepublications/publication/WEO2012_GoldenRulesReport.pdf

[160] *Id.* at 80.

[161] Paulina Jaramillo, W. Michael Griffin, H. Scott Matthews, Comparative Life-Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electricity Generation, 41 Environ. Sci. Technol. 6,290 (2007) (Jaramillo 2007). Available at http://www.ce.cmu.edu/~gdrg/readings/2007/09/13/Jaramillo_ComparativeLCACoalNG.pdf, and attached as Exhibit **71**. The supporting information for this article is available at http://pubs.acs.org/doi/suppl/10.1021/es063031o/suppl_file/es063031osi20070516_042542.pdf, and attached as Exhibit 72 ("Jaramillo Supporting Information"). An earlier, related report with some additional information is Paulina Jaramillo, W. Michael Griffin, H. Scott Matthews, *Comparative Life Cycle Carbon Emissions of LNG Versus Coal and Gas for Electricity Generation* (2005), available at http://www.ce.cmu.edu/~gdrg/readings/2005/10/12/Jaramillo_LifeCycleCarbonEmissionsFromLNG.pdf, and attached as Exhibit 73.

Emissions from liquefaction, transportation and gasification mean that LNG is significantly worse than domestic natural gas in terms of greenhouse gas emissions. For perspective, natural gas *combustion* emits roughly 120 pounds of CO_2e per MMBtu. *See, e.g.*, Jaramillo Supporting Info at 9. Using the above conservative figures, the process of liquefying, transporting, and regasifying LNG accordingly emits 19% to 23% of the CO_2e emitted by natural gas combustion itself—a substantial increase. Jaramillo 2007 concluded that this increase could bring LNG's lifecycle greenhouse gas emissions into parity with coal:

Figure 1: Life-Cycle Emissions of LNG, Natural Gas, and Coal in Electricity Generation[162]



Jaramillo's analysis does not reflect recent studies that have raised estimates for emissions associated with natural gas production. Recent studies have concluded that these emissions are substantial. Because these studies post-date the Jaramillo studies regarding export emissions, they cast still further doubt on any climate advantage to LNG. In particular, the Jaramillo studies were conducted prior to shale gas boom. As noted in part III.B.2.a.i above, shale gas production's methane emissions are drastically higher than those of conventional gas production. Moreover, in April 2011 (well after the Jaramillo studies were published), EPA released improved methodologies for estimating fugitive methane emissions from all natural gas systems (unconventional and otherwise), which lead to higher estimates. EPA, *Inventory of U.S. Greenhouse Gas Emissions And Sinks: 1990 – 2009,* U.S. EPA, EPA 430-R-11-005.[163]

These recent studies estimate that aggregate domestic natural gas production releases at least 44 pounds of CO_2e per MMBtu. A report from the Worldwatch Institute and

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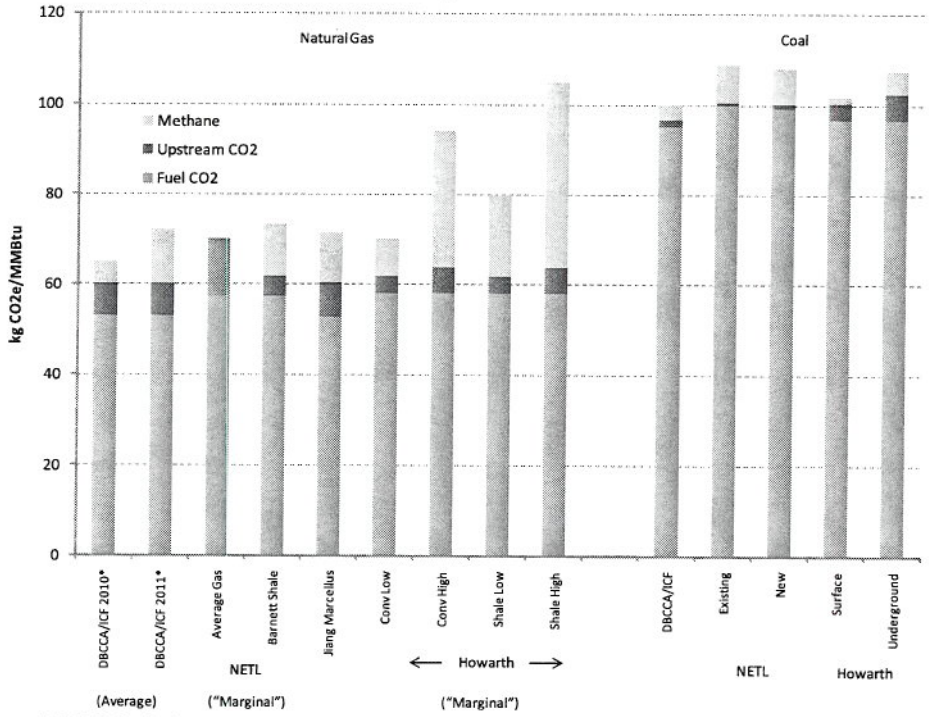
[162] From Jaramillo 2007 at 6,295. "SNG," in the figure, refers to synthetic natural gas made from coal.

[163] Attached as Exhibit 74. The executive summary to this document is Exhibit 15.

Deutsche Bank summarizes much of the recent work.[164] Specifically, the Worldwatch Report synthesizes three other reports that used "bottom-up" methodologies to estimate natural gas production emissions, prepared by Dr. Robert Howarth et al., of Cornell,[165] Mohan Jiang et al. of Carnegie-Mellon,[166] and Timothy Skone of NETL.[167] The Worldwatch Report separately derived a "top-down" estimate, which produced a result similar to the NETL estimate. Worldwatch Report at 9. These various assessments are summarized in the following chart.

Figure 2: Comparison of Recent Life-Cycle Assessments[168]



Source: DBCCA Analysis 2011; NETL 2011; Jiang 2011; Howarth 2011. Note: NETL Average Gas study includes bar shaded grey due to inability to segregate upstream CO2 and methane values, which were both accounted for in the study. See page 10 for more information. *2011 EPA methodology compared to 2010.

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[164] Mark Fulton *et al.*, *Comparing Life-Cycle Greenhouse Gas Emissions from Natural Gas and Coal* (Aug. 25, 2011) ("Worldwatch Report"), attached as Exhibit 75.

[165] Robert W. Howarth *et al.*, *Methane and the greenhouse-gas footprint of natural gas from shale formations*, Climactic Change (Mar. 2011), attached as Exhibit 76.

[166] Mohan Jiang *et al.*, *Life cycle greenhouse gas emissions of Marcellus shale gas*, Environ. Res. Letters 6 (Aug. 2011), attached as Exhibit 77.

[167] Timothy J. Skone, *Life Cycle Greenhouse Gas Analysis of Natural Gas Extraction and Delivery in the United States*, Presentation to Cornell (May 12, 2011), attached as Exhibit 78. NETL has also put out a fuller version of this analysis. *See also* Timothy J. Skone, *Life Cycle Greenhouse Gas Inventory of Natural Gas Extraction, Delivery and Electricity Production* (Oct. 24, 2011), attached as Exhibit 79.

[168] Worldwatch Report at 3.

As this figure demonstrates, although the 2011 studies differ, they all estimate production greenhouse gas emissions (combined methane and "upstream CO_2") of at least 20 kilograms, or 44 pounds, of CO_2e/MMBtu. *Accord* Worldwatch Report at 15. Moreover, it may be that production emissions are significantly higher.

Jaramillo used production emission estimates that are much lower than those produced by the more recent studies, and using the recent and higher figures appears to erode what little climate advantage Jaramillo found LNG to have over coal. Jaramillo used estimates of 15.3 to 20.1 pounds CO_2e/ MMBtu, *i.e.*, estimates that were *at least* 24 pounds lower than the 2011 studies'. Jaramillo Supporting Information at 8. Jamarillo estimated total life-cycle emissions for LNG at 149.6 to 192.3 lbs CO_2e/MMBtu. *Id.* Simply increasing these life-cycle estimates by 24 lbs CO_2e represents a 12% to 16% increase in total emissions. This increase substantially erodes any climate advantage LNG-fired electricity generation may have over coal-fired generation.

Finally, any LNG exported from Jordan Cove will likely have life cycle emissions that are even higher than the above estimates. The above studies generally estimate gas production emissions in aggregate, mixing conventional gas extraction with unconventional sources such as shale gas. As noted above, the EIA Study predicts that extraction induced by exports will overwhelmingly be from shale gas sources, EIA Study at 11, and shale gas has higher production emissions than conventional sources.[169] This fact highlights the need for a thorough study regarding the indirect and cumulative impacts of export prior to any DOE/FE authorization. Further study is similarly needed to combine the analysis of export on fuel switching domestically with life-cycle emissions of LNG exports. Nonetheless, using even the more conservative estimates in the existing record, it is clear that LNG export will provide little, if any, reduction in global greenhouse gas emissions.

2. Jordan Cove's Proposal Will Cause Economic Harm by Raising Domestic Gas Prices and Eliminating Domestic Jobs

The *EIA Study* predicts that LNG exports will significantly increase demand for natural gas and thereby raise domestic gas prices. *EIA Study* at 6. Higher gas prices will in turn hurt American consumers and limit or eliminate manufacturing and farming jobs, in addition to inflicting the environmental effects described above. *Id.*[170] Although Jordan

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[169] EPA recently estimated methane emissions from a conventional well completion at only 0.80 tons, while completion of a hydraulically fractured well yielded 158.55 tons of methane. *See* O&G NSPS TSD at 4-7 (Table 4-2).

[170] *See also* Democratic Staff, House Natural Resources Comm., *Drill Here, Sell There, Pay More: The Painful Price of Exporting Natural Gas* (2012) ("*Drill Here, Sell There, Pay*

Cove criticizes the EIA's predictions, Jordan Cove's criticisms are mistaken. Even if DOE/FE were to accept Jordan Cove's own, lower predictions of price impacts, however, DOE/FE would have to conclude that these impacts constituted a significant harm to the public interest.

As a threshold matter, absent a strong showing that the EIA estimates are inferior to those prepared by Jordan Cove, it would be arbitrary and capricious for DOE/FE to use industry estimates instead of the estimates produced by the impartial federal agency DOE/FE specifically tasked with examining this particular issue. 5 U.S.C. § 706, *Motor Vehicle Mfrs. Ass'n of the United States v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983). Jordan Cove has failed to make such a showing here.

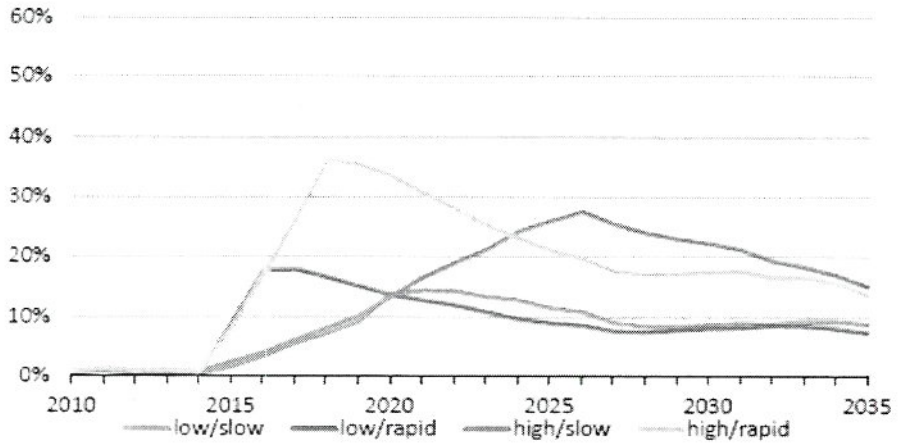
Jordan Cove's criticisms of the EIA predictions are misguided. The *EIA Study* predicts striking price increases from a range of export scenarios. EIA considered several combinations of conditions of shale gas export rates and economic circumstances. It considered a "low" export case of 6 bcf/d, phased in either quickly or slowly starting in 2015, and a "high" case of 12 bcf/d, again phased in quickly or slowly. *EIA Study* at 1. Note that even the EIA's "high" export cases of 12 bcf/d fall far short of the 20.8 bcf/d of exports for which applications are presently pending before DOE/FE and FERC. [171] For perspective, note that 20.8 bcf/d is over 25% of current domestic gas production. EIA, Monthly Natural Gas Gross Production Report (July 31, 2012).[172] These four export volumes and timelines were then evaluated in the contexts of four background scenarios: the EIA's Annual Energy Outlook ("AEO") 2011 reference case, cases where shale recoveries were 50% higher or lower than in the reference case, and a high economic growth reference case. *Id.* Models were run from 2015 (the year in which the first exports were presumed to begin) through 2035. *EIA Study* 1. EIA forecast effects of export on wellhead gas prices, on various gas consumers, and on residential electricity bills. *EIA Study* 6-16. The study summarizes its results for its four export scenarios on the reference economic case as follows:

More"), attached as Exhibit 80; Industrial Energy Consumers of America, *Response to Hamilton Project: "A Strategy for U.S. Natural Gas Exports" by Michael Levi* (July 16, 2012), *available at* http://www.ieca-us.com/wp-content/uploads/07.16.12_IECA-Response-to-Brookings.pdf and attached as Exhibit 81.

[171] http://fossil.energy.gov/programs/gasregulation/reports/Long_Term_LNG_Export_Concise_07-16-12.4.pdf (identifying 18.7 Bcf/d of proposals), Application of Corpus Christi Liquefaction, LLC, FERC docket PF12-3 (FERC pre-filing docket for an additional 2.1 Bcf/d exports).

[172] Available at http://www.eia.gov/oil_gas/natural_gas/data_publications/eia914/eia914.html and attached as Exhibit 82. This report states that, for the month of May 2012, gross U.S. withdrawals (not limited to the lower 48) were 81.51 Bcf/d.

Figure 4:[173] Natural Gas Wellhead Price Percentage Increases from the AEO 2011 Baseline under Four Export Scenarios



In discussing the EIA Study, Jordan Cove first argues that only the "low" export scenarios of 6 bcf/d should be used.[174] Similarly, Jordan Cove's independent forecast of the effects of "aggregate" LNG export assumes exports of 6.6 bcf/d.[175] In light of the 20.8 bcf/d of proposed exports, DOE/FE cannot rest on these low export scenarios. Even the EIA's "high" export scenario considers only 60% of the LNG exports proposed by currently pending applications.[176] Although Jordan Cove may contend that it is unlikely that all, or even 60%, of the proposed export projects will come to fruition or operate at full capacity, the possibility of that volume of exports is hardly so "remote and speculative" that it can be discounted. *See New York v. NRC*, No. 11-1045, 2012 U.S. App. LEXIS 11603, at *27 (D.C. Cir. June 8, 2012) (under NEPA, agency may only exclude analysis of an event and its consequences when the event "is so 'remote and speculative' as to reduce the effective probability of its occurrence to zero."), *San Luis Obispo Mothers for Peace v. Nuclear Regulatory Comm'n*, 449 F.3d 1016, 1031 (9th Cir. 2006) (same). Therefore, DOE/FE must consider the cumulative impacts of all pending export proposals, and thus consider Jordan Cove's application in light of other pending proposals. Consideration of the cumulative effects of the pending proposals is necessary because the public, after all, will not experience each proposed terminal as an individual project: It will experience them cumulatively, through the gas and electricity prices that they will raise and the environmental damage that they will cause. To determine whether any one export proposal is consistent with the public interest, DOE/FE must consider whether a given proposal will harm the public in concert with (a) all proposals

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[173] From the EIA Study, at 8.

[174] Application at 16 (citing Appendix B at 6).

[175] Application at 13.

[176] *See supra* note 172 and accompanying text.

which have already been approved and (b) whether it will cause harm if all reasonably foreseeable proposals were approved. If the answer to this second question is yes, DOE/FE must be able to justify why it is still in the public interest to approve the project before it.[177]

Jordan Cove relatedly argues that even EIA's estimates of the price impacts of "low" export volumes are too high because the EIA study only considered exports.[178] Jordan Cove asserts that exports' impacts on gas prices would be lower if the assumed 6 or 6.6 bcf/d of exports were distributed around the country.[179] Jordan Cove specifically argues that EIA should have considered Dominion Cove Point's pending proposal to export from the East Coast, but Jordan Cove presumably contends that consideration of a West Coast terminal would have the same effect. The pending proposals, however, include more than 18 bcf/d of exports from the gulf.[180] Thus, although it may be that EIA should have included *additional* exports from East or West Coast facilities in its modeling, Jordan Cove offers no justification for simply *moving* the situs of proposed exports and thereby assuming even less than 6 bcf/d of exports from the gulf. There is no reason to believe that adding additional exports from additional geographical locations, rather than simply moving some of the exports from one location to another, would lower the overall price impact.

In addition to criticizing EIA's assumptions on the volume of exports, Jordan Cove also criticizes EIA's assumptions regarding the background of domestic shale gas supplies and production. Jordan Cove argues that actual domestic gas production in 2011 exceeded the level EIA used for its "high" gas supply case.[181] That may be, but at the same time, EIA has also drastically reduced its estimates of total gas supplies. The EIA production cases were derived from EIA's 2011 Annual Energy Outlook, which assumed total domestic reserves of 827 tcf of natural gas. The more recent 2012 Annual Energy Outlook cuts these estimates by over 40%, to 482 tcf.[182] Note that EIA's "low" recovery case assumes a 50% reduction in the production estimated in the 2011 energy outlook

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[177] Although it would be unlawful to consider the price impacts of Jordan Cove's proposed exports in isolation, such consideration would nonetheless reveal a significant impact. Jordan Cove itself predicts that the effects of its exports, if considered in isolation, would increase gas prices in the Pacific Northwest by 3.9% to 7.2%. Application at 15. As the EIA explains, this level of increase is detrimental to consumers, industry, and electricity generators. EIA Study at 6, 11, 15. Jordan Cove offers no argument as to why these increases are not contrary to the public interest.

[178] Application at 17-18 (citing Appendix B at 7).

[179] *Id.*

[180] *See* note 171 *supra*.

[181] Application at 17 (citing Appendix B at 4).

[182] EIA 2012 Annual Energy Outlook at 9, 13, *see also* Exhibit 5.

Because the volume of proposed exports are even greater than EIA's "high" export scenario, and because current estimates of total reserves are much lower than those used in the EIA Study, there is a strong case to be made for using EIA's price predictions for the "high export / low shale EUR" scenarios.[183]

All of EIA's scenarios, however, predict greater price increases than Jordan Cove does. The high export/low recovery scenarios predict that in the years leading up to 2020, wellhead prices will increase over 50%.[184] Similarly, over the longer term, EIA's low-recovery high-export scenarios predict Henry Hub price increases of $1.46 (20%) to $2.33 (32%) by 2025 and $0.94 (10%) to $1.59 (18%) by 2035.[185] EIA predicts similar increases in wellhead prices for these periods.[186] Even the low/slow exports reference case predicts predicts Henry Hub prices to increase by $0.60 per MMBtu, or over 9%, by 2035.[187] These predictions are all significantly higher than Jordan Cove's comparable prediction of 4.9% to 6.7% increases in Henry Hub prices as a result of aggregate exports by 2025.

EIA predicts that in light of these price increases, all consumers of natural gas—residential, commercial, industrial, and electricity generating users—will decrease consumption. EIA Study at 11, 15. Despite decreased consumption, each consumer type would pay a higher total gas bill. As EIA explains:

> On average, from 2015 to 2035, natural gas bills paid by end-use consumers in the residential, commercial, and industrial sectors combined increase 3 to 9 percent over a comparable baseline case with no exports, depending on the export scenario and case, while increases in electricity bulls paid by end-use customers range from 1 to 3 percent. In the rapid growth cases, the increase is notably greater in the early years relative to the later years. The slower export growth cases tend to show natural gas bills increasing more towards the end of the projection period.

EIA Study at 6. Industrial consumers would pay 6.4% to 14.6% more annually. *Id.* at 15.

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[183] There are two such scenarios, differing in the rate at which export facilities enter operation.

[184] EIA Study Figure 4.

[185] EIA Study tables B3 and B4.

[186] *Id.*

[187] EIA Study at Table B4. For other export scenarios and reference cases, EIA's estimates range from $0.40 to $1.59. *Id.*

These percentage increases are very large in absolute terms. In the low/slow scenario, gas and electricity bills increase by $9 billion *per year*, and this increase grows to $20 billion per year in other scenarios. *EIA Study* at 14. Industries particularly dependent on natural gas—such as farming, steel production, fertilizer manufacturing, and chemical manufacturing—will all be particularly impacted by these increases.[188] Increased costs to these industries will likely result job losses, or at least stymied job growth, offsetting job growth exports would create in the natural gas production industry. *Id.*

3. DOE/FE Must Not Act on Jordan Cove's Application Until Pending DOE/FE Export Studies Are Complete

The EIA Study is the first of two studies DOE/FE has commissioned to examine the economic impact of LNG export. DOE/FE should not process Jordan Cove's application until the second phase of this study is complete and the public has had an opportunited to comment thereon.

The EIA Study resulted from DOE/FE's request that the Energy Information Administration ("EIA") analyze "the impacts of increased domestic natural gas demand, as exports." EIA, *Effect of Increased Natural Gas Exports on Domestic Energy Markets* ("*EIA Study*"), p.1 (Jan. 19, 2012).[189] This study predicts price increases from all gas export scenarios, economically impact residential and industrial users and causing environmental harm by causing gas fired electricity generation to switch to coal power. *Id.* at 6. The study did not, however, consider the macroeconomic impacts of these effects. *Id.* at 3.

DOE has stated that it has commissioned a second study that will consider these impacts. For example, Christopher Smith, DOE Deputy Assistant Secretary for Oil and Natural Gas, expressed this commitment to Representative Edward J. Markey in a letter dated February 24, 2012.[190] DOE further stated that it would not grant final authorization to any pending export application until review of these studies was complete. *Id.*

DOE/FE must honor this commitment with respect to Jordan Cove's application. Moreover, because the forthcoming study will inform DOE/FE's decision, DOE/FE should not take action on the application (including granting a conditional authorization) until the public has had an opportunity to comment on this fundamental and underlying study. Because the forthcoming study should address fundamental issues underlying the

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[188] Drill Here, Sell There, Pay More at 9-13; Industrial Energy Consumers of America, *Response to Hamilton Project: "A Strategy for U.S. Natural Gas Exports" by Michael Levi* (July 16, 2012).

[189] Attached as Exhibit 5.

[190] *Drill Here, Sell There, Pay More* (Appendix 1 at 3).

public interest analysis, any public interest analysis made pursuant to a conditional authorization would need to be wholly revisited once the study is released.

4. The Economic Benefits Jordan Cove Predicts are Uncertain and Overstated

Jordan Cove claims that its export proposal will produce billions of dollars in economic benefits and tens of thousands of jobs. This claim primarily rests on predictions regarding the jobs and economic benefit that Jordan Cove claims will result from producing the natural gas Jordan Cove proposes to export. These predictions, however, rest on a flawed analysis that overstates the number and quality of jobs created. Empirical studies of communities in which the shale gas boom has occurred reveal a much less rosy picture, with a boom-bust economic cycle and creation of merely temporary transient jobs rather than permanent full time jobs in the affected communities. Jordan Cove's predictions regarding job creation and benefits relating to construction and operation of the pipeline and terminal rest on a similarly flawed methodology. As such, Jordan Cove's claims of economic benefit are overblown and should be discounted by DOE/FE.

a. Jordan Cove's Jobs Arguments Rest on Flawed IMPLAN input-output models

Jordan Cove's arguments relating to job creation and economic benefit all rest on predictions made using IMPLAN modeling software. *See, e.g.*, Application at 20. To use IMPLAN or any other input-output model, the user inputs a description of economic activity in a given set of economic sectors, and the model responds by tracing this spending through the economy. Specifically, the model uses accounting tables to track how the initial expenditure will flow through various industrial sectors and then uses local multipliers to estimate how this allocation will alter employment decisions.

IMPLAN, like input-output models generally, suffers from numerous significant limitations and thereby drastically overestimates economic benefits. A recent study by Amanda Weinstein and Dr. Mark Partridge, of Ohio State University, explains why many of these limitations matter in the shale gas context. *See* Amanda Weinstein and Mark D. Partridge, *The Economic Value of Shale Natural Gas in Ohio*, OHIO STATE UNIVERSITY, Swank Program in Rural-Urban Policy Summary and Report (December 2010) ("*Ohio Study*").[191] Further limitations are discussed by David Kay, *The Economic Impacts of Marcellus Shale Gas Drilling: What Have We Learned? What are the Limitations?* (Apr. 2011).[192]

First, input-output models do not consider counterfactuals and foregone opportunities. They map the consequences of a particular expenditure, rather than asking how the

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[191] Attached as Exhibit 83.
[192] Attached as Exhibit 84.

economy might have grown had investors and regulators made different choices. Nor do they consider how the particular choice at issue might displace other economic activity. The absence of a counter-factual is at the core of the Ohio Study's critique. *Id.* at 11. As the Ohio Study explains:

> Impact analysis . . . is usually based on an old input-output technology that is typically not used today by economists to estimate actual economic effects. Impact studies do not include various displacement effects and do not reflect the true counterfactual of comparing what would have happened without natural gas drilling. For example, oil and natural gas drilling would lead to higher local wages and land costs, which reduce employment that would have occurred elsewhere in the economy. Likewise, the environmental effects may reduce activity in the tourism sector and other residents may not want to live near such degrading activity. Finally, greater natural gas employment means that there are fewer jobs in coal that would have occurred without the increase in natural gas employment.

Id. (emphasis in original).

Second, input-output studies may not reflect actual spending patterns, as the Ohio Study explains. *Id.* at 14-15. For example, landowners given gas production leases may choose to save their money, rather than to spend it. *Id.*

Third, input-output models are static, providing a series of one-year snapshots. Thus, input-output models measure "job-years" but not jobs held year to year. As the Ohio Study explains,

> impact studies do not produce continuous employment numbers. If an impact study says there are 200,000 jobs, this does not mean 200,000 workers are continuously employed on a permanent basis. For example, there are workers that do site preparation. Then there is another group who do the drilling followed by another group who maintains the well when it is in production. Finally, there is an entirely different group doing pipeline construction, and so on. So, while the public is likely more interested in continuous ongoing employment effects, impact studies are producing total numbers of supported jobs that occur in a more piecemeal fashion.

Ohio Study at 11.

Fourth, input-output models cannot determine how many jobs are *created*. The model identifies the number of jobs *supported* by the predicted spending. *Id.* Job support cannot be treated as job creation without consideration of a counterfactual, however, because absent a counterfactual, it is impossible to determine whether the job would have existed without the project under consideration. *Id.* This flaw is particularly apparent here, because Jordan Cove claims "credit" for every job connected to entire share of the domestic production of 0.8 bcf/d of gas Jordan Cove seeks to export. Although Sierra Club agrees that much of this volume of gas would come from new, induced production and hence new jobs, a proper accounting of benefit to the public interest would need to identify what fraction of this production would have occurred otherwise, claiming credit only for jobs associated with the production that would only occur in response to the project under consideration.

Fifth, as a result of the above limitations, input models are not readily able to "evaluate economic circumstances in which the change in the economy has been or will be rapid and large," or to deal with the complicated series of individual choices and community disruptions (including the displacement of existing economic activity) occasioned by the boom. David Kay, *The Economic Impacts of Marcellus Shale Gas Drilling: What Have We Learned? What are the Limitations?*, 5-6, 22-30 (Apr. 2011).[193] Input output models struggle, particularly, to map these distributional effects, where some prosper while others suffer, and, more generally, is not designed to chart the long-term effects of such major dislocations. *See id.* at 22-30.

In summary, input-output model result should be seen as estimates of solely the effects of increased expenditures on a particular project (here, gas exports and production), and limited and overly-optimistic ones at that, rather than as a reliable comparison of how the economy would fare with and without gas exports. The Natural Gas Act's "public interest" test requires DOE/FE to determine whether the country would be better off with Jordan Cove's proposal than without it. Input-output -based analyses cannot answer this question, but these are the only analyses Jordan Cove offers.

b. Empirical Analysis Reveals Offsetting Economic Harm as Well As Decreased Economic Benefit

Available empirical data shows that the real economic effects of increasing gas production are far more limited and equivocal than Jordan Cove claims. The Ohio Study works to describe these effects by analyzing the counterfactual that input output model results lack. It begins by noting that Pennsylvania, the center of the shale gas boom, does not appear to be creating nearly as many jobs as industry claims suggest. Bureau

[193] *See* Exhibit 84.

of Labor Statistics for 2004-2010 show that *all* oil and gas sector jobs (not just those in shale gas, or those drilling new wells), increased by only about 10,000 in the state over that period. Ohio Study at 12.

The study went further, using Bureau of Economics Analysis statistics to directly compare employment and income in counties in Pennsylvania with significant Marcellus drilling and those without significant drilling, before after the boom started. As Table 1, below, shows, counties in both areas *lost* jobs during the boom (after 2005)—and, though that result is reasonable considering the economic downturn in those years, it is striking that drilling counties declined at a slightly *faster* rate in that period, though per capita income also increased more quickly in those counties.

Table 1: Comparing Pennsylvania Counties, With and Without Drilling, Over Time[194]

	Employment Growth Rate 2001-2005	**Employment Growth Rate 2005-2009**	**Income Growth Rate 2001-2005**	**Income Growth Rate 2005-2009**
Drilling Counties	1.4%	-0.6%	12.8%	18.2%
Non-Drilling Counties	5.3%	-0.4%	12.6%	13.6%

The jobs effect, in either direction, turns out to be too small to be statistically significant. *Id.* at 16. This is not a surprising pattern: Incomes likely rise thanks to lease payments to some landowners, and some degree of hiring for high-income production decisions, but extraction displaces other workers, or jobs go to out-of-state workers rather than to residents who likely lack industry experience. *See id.*

A set of more detailed studies from Cornell University's Department of City and Regional Planning largely confirm this pattern. Those researchers spent more than a year studying the economic impacts of the gas boom on Pennsylvania and New York. Their core conclusion is that boom-bust cycle inherent in gas extraction makes employment benefits tenuous, and may leave some regions hurting if they are unable to convert the temporary boom into permanent growth. As the researchers put it:

> The extraction of non-renewable natural resources such as natural gas is characterized by a "boom-bust" cycle in which a rapid increase in economic activity is followed by a rapid decrease. The rapid increase occurs when drilling crews and other gas-related businesses move into a region to extract the resource. During this period, the local

[194] Adapted from Table 1 of the *Ohio Study* at 15.

> population grows and jobs in construction, retail and services increase, though because the natural gas extraction industry is capital rather than labor intensive, drilling activity itself will produce relatively few jobs for locals. Costs to communities also rise significantly, for everything from road maintenance and public safety to schools. When drilling ceases because the commercially recoverable resource is depleted, there is an economic "bust" -- population and jobs depart the region, and fewer people are left to support the boomtown infrastructure.

Susan Cristopherson, CaRDI Reports, *The Economic Consequences of Marcellus Shale Gas Extraction: Key Issues* ("*Cornell Study*") (Sept. 2011) at 4.[195] This boom and bust cycle is exacerbated by the purportedly vast resources of the Marcellus play, because regional impacts will persist long after local benefits have dissipated, as the authors explain, and may be destructive if communities are not able to plan for, and capture, the benefits of industrialization:

> [B]ecause the Marcellus Play is large and geologically complex, the play as a whole is likely to have natural gas drilling and production over an extended period of time. While individual counties and municipalities within the region experience short-term booms and busts, the region as a whole will be industrialized to support drilling activity, and the storage and transportation of natural gas, for years to come. Counties where drilling-related revenues were never realized or could have ended may still be impacted by this regional industrialization: truck traffic, gas storage facilities, compressor plants, and pipelines. The cumulative effect of these seemingly contradictory impacts – a series of localized short-term boom-bust cycles coupled with regional long-term industrialization of life and landscape – needs to be taken into account when anticipating what shale gas extraction will do communities, their revenues, and the regional labor market, as well as to the environment.

Id. (emphasis in original). The benefits of gas development are, in other words, not smoothly distributed, in space or in time. Some people will prosper and some will not during the resultant disruption and, warn the Cornell researchers, the long-term effects

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[195] Attached as Exhibit 85.

may well not be positive, based upon years of research on the development of regions dependent on resource extraction:

> [T]he experience of many economies based on extractive industries warns us that short-term gains frequently fail to translate into lasting, community-wide economic development. *Most alarmingly, a growing body of credible research evidence in recent decades shows that resource dependent communities can and often do end up worse than they would have been without exploiting their extractive reserve.* When the economic waters recede, the flotsam left behind can look more like the aftermath of a flood than of a rising tide.

Id. at 6 (emphasis supplied).

The researchers also outline many of the challenges communities face as they attempt to benefit from natural gas development. Most obviously, it is difficult to convert technical natural gas field jobs directly into sustainable, well-paying local employment. *See* Jeffrey Jacquet, *Workforce Development Challenges in the Natural Gas Industry* (Feb. 2011).[196] This is in part because the industry's employment patterns are uneven: the researchers cite Pennsylvania employment data showing that "*the drilling phase accounted for over 98% of the natural gas industry workforce* engaged at the drilling site," and complementary Wyoming data showing a similar drop-off. *Id.* at 4 (emphasis in original). As a result, drilling jobs correspond to the boom and bust cycle inherent to resource extraction industries. *Id.* The remaining, small, percentage of production phase and office jobs are far more predictable, *id.* at 4-5, but need to filled with reasonably experienced workers, *id.* at 12-14. Although job training at the local level can help residents compete, the initial employment burst is usually made up for people from out of the region moving in and out of job sites; indeed, "[t]he gas industry consistently battles one of the highest employee turnover problems of any industrial sector." *Id.* at 13.

Meanwhile, communities also confront a panoply of development issues, ranging from coping with sudden population increases, major road damage from drilling operations, damage to the tourism industry, and a host of environmental risks (discussed in more detail below). *See, e.g.*, CJ Randall, *Hammer Down: A Guide to Protecting Local Roads Impacted by Shale Gas Drilling* (Dec. 2010)[197]; Susan Riha & Brian G. Rahm, *Framework*

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[196] Attached as Exhibit 86.

[197] Attached as Exhibit 87.

for Assessing Water Resource Impacts from Shale Gas Drilling (Dec. 2010)[198]; *Cornell Study* at 8).

These tourism threats are particularly concerning for many parts of Marcellus region, including New York's Southern Tier, because tourism is a major source of income and employer. In the Southern Tier, according to one recent study, the industry directly accounts for $66 million in direct labor income, and 4.7% of all jobs, and supports 6.7% of the region's employment. Andrew Rumbach, *Natural Gas Drilling in the Marcellus Shale: Potential Impacts on the Tourism Economy of the Southern Tier* (2011).[199] Although the study concludes that the near-term economic impact of gas drilling would likely be positive, it identifies two "major caveats" – that the monetary value of the gas industry underestimates its disruption to the region's stability and way of life, and that gas drilling benefits "will be relatively short-term and non-local." *Id.*at 9. Once again, simple arguments for the raw economic benefits of gas extraction's benefits turn out to conceal complex social and economic consequences, and a complicated mix between benefits and costs in each particular place the industry affects.

The point of all this, of course, is that a simple economic model, like IMPLAN, cannot reliably capture the consequences of transforming an entire region of the country, converting it from a largely rural swath of small towns, farms, and forests into an industrial gas extraction zone. That transformation will benefit some discrete actors considerably, and some communities, if they are able to navigate the durable challenges of boom and bust economics. But it will also harm people, by displacing existing businesses and lifeways, straining infrastructure, shifting populations, and, potentially, leading to devastating economic crashes in some areas.

5. **DOE/FE Cannot Rationally Approve Jordan Cove's Export Plan On the Record Before It**

The Natural Gas Act, and subsequent DOE delegation orders and regulations, charge DOE/FE with determining whether or not a gas export application is in the public interest. *See, e.g.* 15 U.S.C. § 717b(a). DOE/FE must make this decision on the record before it. This means that, regardless of DOE/FE's decision to presume, initially, that an application should be granted, this presumption does not, and cannot, absolve DOE/FE of its duty to make its *own* determination. *Panhandle Producers and Royalty Owners Ass'n*, 822 F.2d at 1110-1111. Simply put, "the *agency* must examine the relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made." *Motor Vehicle Mfrs. Ass'n of the United States v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (emphasis supplied). DOE/FE cannot rationally find for Jordan Cove on the record in this case.

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[198] Attached as Exhibit 88.
[199] Attached as Exhibit 89.

As we have demonstrated, record support for Jordan Cove's claimed benefits is extraordinarily thin. Jordan Cove has submitted input-output model derived argument of economic benefit, but the underlying model does not show whether the economy would improve *more* without Jordan Cove proposal than it would without it, nor address the many costs and displacement effects associated with natural gas booms. Jordan Cove further argues that export will not cause gas price increases, but this argument is contradicted by the *EIA Study* that DOE/FE itself commissioned.

Sierra Club, on the other hand, has shown that the gas and electricity price increases associated with exports will add billions of dollars in costs to the consumers. These costs will propagate through the economy, retarding growth. Sierra Club has also shown that the economic benefits, if any, associated with gas production increases may actually do long-term damage to the U.S. economy by plunging large regions of the country into a boom-and-bust extractive cycle. Further, Sierra Club has shown that gas extraction and export have major environmental (and, hence, additional economic) costs, which Jordan Cove has failed to even acknowledge.

On this record, DOE/FE cannot approve export. Were it do so, it would be violating basic norms of agency record rulemaking, as well as its own rules. *See, e.g.*, 5 U.S.C. § 706; 10 C.F.R. § 590.404 (requiring DOE/FE to base its final opinion "solely on the official record of the proceeding" and to impose terms "as may be required by the public interest" after record review).

In this case, this record review data requires that DOE/FE play particularly close regard to both the positive and negative impacts of gas export and extraction. Jordan Cove application discusses only the purported benefits of its proposal, casting a wide net in hopes of capturing indirect and induced economic activity, while failing to recognize the environmental and economic costs of that same activity. If DOE/FE were to consider the benefits of increased gas production without also considering the costs, it would have "entirely failed to consider an important aspect of the problem, [or] offered an explanation for its decision that runs counter to the evidence before the agency. *State Farm*, 463 U.S. at 43. It must not do so.

At bottom, the decision to export U.S. gas resources is a major public policy decision and must, by law, be made with extraordinary care. DOE/FE cannot justify moving forward on the scanty and incomplete record before it.

D. If DOE/FE Does Move Forward, It Must Impose Rigorous Monitoring Conditions

If DOE/FE nonetheless approves Jordan Cove's application, it must recognize its continuing duty to protect the public interest, as it explained in its *Sabine Pass* decision. This duty is of crucial importance in the context of LNG export, where circumstances are

rapidly changing. DOE/FE therefore announced its intention to monitor environmental, economic, and other relevant considerations. *Sabine Pass* at 31-33. Such a monitoring provision must be imposed here, as well, but must be significantly expanded.

Specifically, although *Sabine Pass* announces an intention to monitor many different considerations, it most clearly states that the agency will act if there is a "reduction in the supply of natural gas needed to meet essential domestic needs." *Id.* at 32. This consideration is undoubtedly of great importance, but it is not the only way in which changing circumstances could imperil the public interest.

On the contrary, as we have demonstrated at length in these comments, there is strong evidence that the public interest will be impaired by gas exports. These impairments include (1) regional and national economic dislocations and disruptions caused by natural gas extraction, including by the industry's boom-and-bust cycle, (2) national increases in gas and electricity prices and resulting shifts to more polluting fuels, (3) and environmental impacts of many sorts. Any one of these categories of interests could be impaired by gas export. DOE/FE must therefore state that it will monitor each of these areas, providing specific monitoring terms and thresholds which will trigger agency actions of various types, ranging from further study through reductions in export volume or changes in timing to a revocation of DOE/FE's approval.[200]

If DOE/FE fails to include such provisions in any final approval, it will fail to fulfill its "continuing duty to protect the public interest," *id.* at 31, and so violate the Natural Gas Act. Because neither Jordan Cove nor DOE/FE have described or proposed such terms, Sierra Club also protests this application to the extent that DOE/FE fails to develop adequate monitoring terms of the sort we have described.

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[200] Providing a clear monitoring plan of this sort will also benefit Jordan Cove, which will be better able to determine when and how DOE/FE may act, improving the company's ability to plan its actions and investments.

IV. Conclusion

Sierra Club therefore moves to intervene, offers the above comments, and protests Jordan Cove's export proposal for the reasons described above. Jordan Cove's application is not consistent with the public interest and must be denied.

Respectfully submitted,

Nathan Matthews
Sierra Club Environmental Law Program
85 2nd St., Second Floor
San Francisco, CA 94105

UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

IN THE MATTER OF	)	
	)	**FE DOCKET NO. 12-32-LNG**
Jordan Cove Energy Project, L.P.	)	
	)	

CERTIFICATE OF SERVICE

I hereby certify that I caused the above documents to be served on the applicant and all others parties in this docket, in accordance with 10 C.F.R. § 590.017, on August 6, 2012.

Dated at San Francisco, CA, this 6th day of August, 2012.

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UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
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IN THE MATTER OF	)	
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Jordan Cove Energy Project, L.P.	)	
	)	

CERTIFIED STATEMENT OF AUTHORIZED REPRESENTATIVE

Pursuant to C.F.R. § 590.103(b), I, Nathan Matthews, hereby certify that I am a duly authorized representative of the Sierra Club, and that I am authorized to sign and file with the Department of Energy, Office of Fossil Energy, on behalf of the Sierra Club, the foregoing documents and in the above captioned proceeding.

Dated at San Francisco, CA, this 6th day of August, 2012.

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UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

IN THE MATTER OF	)	
	)	**FE DOCKET NO. 12-32-LNG**
Jordan Cove Energy Project, L.P.	)	
	)	

VERIFICATION

SAN FRANCISCO	§
	§
CALIFORNIA	§

Pursuant to C.F.R. §590.103(b), Nathan Matthews, being duly sworn, affirms that he is authorized to execute this verification, that he has read the foregoing document, and that facts stated herein are true and correct to the best of his knowledge, information, and belief.

Nathan Matthews
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Subscribed and sworn to before me this 3rd day of August, 2012.

Notary Public

MARK DAVID BOSLER
Commission # 1977496
Notary Public - California
San Francisco County
My Comm. Expires Jun 3, 2016

My commission expires: 6-3-16